

AN INVESTIGATION OF THE
ASSESSMENT OF THREAT

by

Chadwick Hunter Dennis

United States Naval Postgraduate School



THESIS

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April 1970

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An Investigation of the Assessment of Threat

by

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ABSTRACT

This timely work concerns itself with a methodological investigation of the complex phenomenon of threat assessment at the Defense Department level. Through the device of propaedeutic and heuristic discussion the controversial aura surrounding present day threat assessment is explored. Several methods that have been used or might possibly be used to assess threat are outlined. The paper concludes with the optimistic remark that with further effort a pragmatic and reproducible method of assessing threats to this nation should be forthcoming.

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To my wife, Sandra Dennis, I find I must give the remainder of the credit for this work's final completion. For without her typing ability and her gentle encouragement I would surely never have finished.

I. PREFACE

The author was first attracted to this subject by the lack of documentation dealing with the subject of threat assessment methodologies and the cavalier construction of threat assessments in many studies. The original title which was envisioned for this work was "The Use of Subjective Factors in the Assessment of Threat." After this initial formulation, several weeks of research indicated that finding methods to utilize subjective factors in threat assessment necessitated finding out how threat was assessed in current studies. The research was then reoriented and the title was changed to read "The Assessment of Threat as Practiced in Systems Analysis." However, further research uncovered that no cut-and-dry method existed to assess threat and certainly no method had been constructed to specifically handle this complex problem. Thus, through this process the author finally entitled this paper "An Investigation of the Assessment of Threat." This title implies an uncovering of methods, among other things. In this sense, the implication was true. This paper certainly did not find existing threat evaluation procedures profuse in the literature or methods that were universally accepted. The research effort presented evidence of a miasma of concepts, methodologies and philosophies that were interpreted as methods used to assess threat. A discussion of why these concepts, methodologies and philosophies should be used to attack the assessment of threat was never found in the literature.

The construction of this paper and the ordering of the arguments into the particular sections that follow was premeditated and purposeful. Section II, the introductory section, was intended to entice the reader to go on by presenting the fundamental motivation of this research which was the proper allocation of defense resources. It further served as an introduction to the writing style of the author. Section III informs the reader of the author's perspectives which guided the research for this paper. Section IV serves as a propaedeutic and a heuristic base for discussion of the nature of the problem of threat assessment in the next section. Section IV touches on the myriad factors that plague defense planners concerning this problem and attempts to give insight into why these aspects are relevant when dealing with threat assessment. Unless the reader has successfully coped with the assessment of threat, the reading of Section IV cannot be omitted. Section V describes the nature of the problem of threat assessment and emphasizes why this nature cannot as yet be fully outlined. Section VI covers five categories of methods that classified present methods that have or could have been used in the assessment problem. The last section presents the conclusions, recommendations and proposals for further research that the paper generated.

Almost all readers will understand every theme contained in the introductory and perspectives sections (Sections II and III). The discussion section (Section IV) should bring

the average reader to the tentative conclusion that the problem of threat assessment is entirely too complex to be solved at this time. The section dealing with the problem's nature (Section V) should again reinforce this tentative conclusion. It is the author's hope that the methods section (Section VI) will allow the reader insight into just how one may come to grips with threat assessment in the future. Hopefully, this section will force the reader to reassess his tentative conclusions concerning the impossibility of properly assessing threat. The concluding section may serve as a springboard for further thesis research at the Naval Postgraduate School.

The preceding predictions of the reader's reactions to this paper are parallel to the author's reaction during the conduct of the research and writing of the paper. At this writing a sense of optimism affects the author concerning the future development of an adequate method of threat assessment.

II. INTRODUCTION

Secretary of Defense Melvin R. Laird said today the United States will have to consider possible production of a new strategic bomber or deploy more strategic missiles at sea if the Soviet Union's offensive threat continues to mount.¹

Senator William Proxmire said today that military spending should be cut by \$10 billion. "We found from expert testimony we took that the Russians are not ten feet tall," the Wisconsin Democrat said in releasing a report by a subcommittee of the Joint Economic Committee of Congress. Mr. Proxmire is chairman of the subcommittee and vice-chairman of the parent panel. "In fact, based on our military outlays and economic strength," he said, "If we are six feet tall the Russians by comparison are three feet tall and the Chinese are six inches tall." . . . Mr. Proxmire's assessment that the Soviet Military threat is half that of the United States was based on testimony of what the Subcommittee Report called eight experts on Soviet affairs, who estimated Russia's gross national product at half that of the United States. "While it would be unrealistic to underestimate one's potential adversary," the report said, "The Subcommittee is disturbed by a tendency of some to magnify the strength of the Soviet military establishment. Expenditure of unnecessary sums for defense leads to misallocation of our own resources and therefore weakens this nation in the long run."²

These statements are typical of the controversial aura that seems to surround threat assessment today. The realistic quantification of threat, whatever threat may be, and the relation of this assessment to Department of Defense spending

¹ Associated Press dispatch, The Monterey Peninsula Herald, (California), January 7, 1970.

² Associated Press dispatch, New York Times, December 28, 1969.

and programs is extremely difficult. Or is it? Many so-called experts are quick to present their method of dealing with the problem. Political analysts seem to blithely count Russian missiles, dissect possible intents to use these missiles and through some thought process equate this analysis to the proper amount of missiles, troops, bomb shelters or whatever that must be acquired for Defense Department programs. Some military thinkers utilizing experience and judgment, make the same connection justifying their assessment with historical examples and the assessment of potential enemies' possible intents. Most students of analysis of defense spending admit nothing other than a threat exists at some primitive and universally understandable level and proceed from there with schemata to counter the threat. On the other hand, many dismiss all assessments with the exception of the most general predictions, as looking into the future and an impossible task anyway.

Our national resources and the annual budget have infinite uses in the areas of strategic defense, environment, population control, urban renewal and of course, the prosecution of a very real, limited conflict, Viet Nam. An economist would say we are faced with maximizing "the problems solved" given a limited budget allocation. With the largest portion of the Federal Budget, the Defense Department offers the hope of the greatest cutbacks and therefore, further reapplication of the budget to other critical problem areas.

Alain Enthoven emphasized that, "One simply cannot decide rationally on a national security policy independently of the quantitative aspects of enemy capabilities."³ The fundamental theme here is the more accurate the assessment of threat the less waste of resources to cope with it.

This paper does address accurate threat estimation. This paper does not address the relationship between political decision-making and rational models based on accurate threat estimation. This paper does not survey methods used by the Defense Department that address threat assessment, although the paper inherently touches on them.

This paper is not cast in the role of a methodological standard providing a basis for determining the extent to which research dealing with threat is controlled and hence, scientific. But if there exists such a methodological standard in systems analysis this paper is intended to assist in making explicit the conception of the best approach to threat assessment research procedures in an effort to facilitate future improvements in both the standard and one's efforts to approximate it.⁴

In the end, the attempt to investigate possible methodology for verification of threat assessments is equivalent to the attempt to outline a scientific discipline of inter-country relationships. Do not take this paper so. But rather

³ Enthoven, A. C., "Operations Research at the National Policy Level," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), p. 157.

⁴ Ackoff, R. L., Scientific Method Optimizing Applied Research Decisions (John Wiley and Sons, Inc., 1962), pp. 6-7.

take it as an attempt to preposition one's intellect to vilify anyone claiming its accomplishment.

Thus, what can be answered by this paper is a function of the reader's interest in the problem and the value of coping with research attempting to quantify threat. The endeavor was to provide propaedeutic and heuristic bases for further attempts at threat assessment.

III. PERSPECTIVES

Implicitly, every paper is written from personally ascribed perspectives. The nature of the problem of threat assessment dictates an explanation of why these particular perspectives were set down.

It is the contention of this paper that in many circles threats to this country seem to be well understood phenomena for the individuals concerned. For example, it seems sufficient that the public of the United States be aware of the general nature of certain existing threats to this country. This allows understanding of the legislative and policy processes that go on in relation to countering these threats. However, knowledge of the general nature of threats to this country is not sufficient for decision-makers who can do something about threats. These considerations are why these perspectives were set down. The perspectives are for the reader to adopt to insure the reader not to cling to his own perhaps naive points of view.

A perspective may be defined as the selection of a position from which to view something one is desirous of viewing. With the thought in mind that the something may be unviewable, the following perspectives were used to view the assessment of threat.

A. DEVELOPMENTAL RESEARCH

Research that is directed toward the solution of problems that can be divided into two major classes,

evaluative and developmental. An evaluative problem is one in which the alternative courses or action are completely specified in advance and the solution consists of selecting the "best" of these. A developmental problem involves the search for (and perhaps construction or synthesis of) instruments which yield a course of action that is better than any available at the time.⁵

This paper is developmental research which is searching for methods that yield policies that are pragmatic in the sense that they realistically and rationally cope with threat assessment and successfully relate its quantification to defense spending.

The study of scientific methods is frequently referred to as methodology. The objective of methodology is the improvement of the procedures and criteria employed in the conduct of scientific research. For this reason, methodology is often referred to as the logic of science. And for this reason, this particular perspective can be said to view the assessment of threat from the standpoint of the logic of threat assessment methods.

B. SUFFICIENCY OF SYSTEMS ANALYSIS

The installation of systems analysis and its basis in quantification, at the national policy level⁶ prompted this investigation. Policy makers were thought to have been

⁵ Ibid., p. 24.

⁶ Hitch, C. J., "Development and Salient Features of the Programming System," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), pp. 84-85.

driven to this method in order to have a surrogate for experience because of increasing complexities which confronted them.⁷ It was felt the old patriotic emotional process supposedly employed in the past must take a back seat to intellectual processes such that one's attention is to the question of what's right, not who's right,⁸

It is abundantly clear that the Defense Department has acted as if a real and palpable threat existed and that with the tools at hand was able to justify its plans and programs in relation to this threat. It was not clear⁹ that the method of systems analysis was sufficient to adequately partake in this justification. Therefore, this perspective sought to view systems analysis as practiced in the Department of Defense with a critical eye in an attempt to evaluate its sufficiency as a method used in threat assessment.

C. MEASUREMENTS

Since the perspective of the sufficiency of systems analysis was adopted it was in context to question the measurements one must have taken in order to quantify threat to

⁷ Quade, E. S. and Boucher, W. I., (ed.), Systems Analysis and Policy Planning (American Elsevier Publishing Co., Inc., 1968), pp. 5-6.

⁸ Enthoven, A. C., "Choosing Strategies and Selecting Weapon Systems," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), p. 148.

⁹ Green, P., Deadly Logic: The Theory of Nuclear Deterrence (Ohio State University Press, 1966), p. 78.

practice systems studies. In his book, Prediction and Optimal Decision, Churchman has stated, "All description methodologically entails prediction. In general, all measurement takes place within the context of a theory."¹⁰

Churchman further argued that deciding what sort of measurement to take to represent concepts is essentially a decision-making activity. This implies measuring may not be properly located in the realm of systems analysis. Since the objective of measurement could be accomplished in several ways and was dependent upon one's decisions, could analysts decide what to measure or should decision-makers have been involved? Once this question had been resolved and measurements were attempted, one found no theory of measurements as a guide in the conduct of measuring.¹¹ Analysts do not know why they go about quantification in the manner they do. Each one developed his own theory and conducted his measuring from this basis. These perspectives took the place of a theory of thesis construction and were developed by the researcher. The method of systems analysis can be characterized as ways of creating on-the-spot theories to solve complex problems of choice. Were the theories of measurement constructed by analysts sufficient to characterize threat? This perspective was adopted to examine some of these theories. Again it is appropriate to cite Churchman.

¹⁰ Churchman, C. W., Prediction and Optimal Decision (Prentice-Hall, Inc., 1961), p. 85.

¹¹ Ibid., p. 102.

In other words, theories of science (in this paper, threat assessment) are not tested by a set of data arrived at independently of the theory itself. Data-collectors are not objective arbiters of truth who have never been embroiled in the disputes they arbitrate. Data-collectors have used a theory to collect their data. Unification of specific effort occurs when we can understand the relation between a theory and the theory of data collection used to test the theory.¹² (Comments in parentheses mine)

D. BASIC SUBJECTIVITY OF SCIENTIFIC METHOD

There exists primitive notions in our society that scientific activity in general is a cold hard analysis with objective methods being utilized. Further notions declare science as independent of the personalities involved.¹³ These notions were rejected in this paper. The fundamental subjectivity that partakers in scientific activity display does bend and mold science in various directions. Scientific activity was thought of as a way of accomplishing some objective in a particular manner and invented and pursued by mankind (with all that entails). As applied to all objectives, no value judgment was made as to whether science is better than common sense. Had this judgment been made prior to this paper, no need would have existed to write it.

To use Ackoff's apt phrasing, the perspective adopted was:

Quantification at any stage depends on qualification. What is qualified at one stage may be

¹² Ibid., p. 133.

¹³ Enthoven, A. C., "Choosing Strategies and Selecting Weapon Systems," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), p. 139.

quantified at another, but at any stage some qualitative judgments are required. Consequently, progress in science not only is a function of an increased capacity to quantify efficiently (i.e., to measure) but also depends on an increased capacity to qualify efficiently.¹⁴ (Underscoring mine)

Once some ultimately right belief toward scientific activity is discarded and acceptance that all human activity is fundamentally subjective, one can then view the objectivity of science as not how right or wrong it is, but as what objectives science seeks to achieve. Clear precise objectives with well thought-out procedures to attempt their accomplishment is the ultimate attraction of scientific activity. Science attaches a sense to human existence and orders human activity to realize more quickly human objectives. So do hunches.

E. APPLICATIONS

Analytic techniques of systems analysis can be applied to defense and military problems in a spectrum ranging from the routine to the vital one-time decisions of top-level national security decision-makers. This spectrum may be divided into the following categories: management of operations, choice of tactical alternatives, design and development of weapons systems and determination of major policy alternatives.¹⁵

This paper endeavors to perceive the problem of threat assessment from the viewpoint of the last two categories: systems design and development and policy determination.

¹⁴ Ackoff, op. cit., p. 21.

¹⁵ Quade and Boucher, op. cit., p. 7.

IV. DISCUSSION

A. GENERAL

The fiscal year 1969 found the United States spending \$79.16 billion on defense alone. Net expenditures for that same year of the national government were \$184.764 billion.¹⁶ More than forty-two percent of the nation's budget went toward defense. Defense against what? is one of the questions this paper investigates in an attempt to critically examine how we as a nation go about justification of this fantastic sum in the common defense. The defense against threats to this country is a complex problem area. This problem includes the enumeration of threat in some manner. It may be that systems analysis and the scientific method cannot enumerate threat. But prior to this conclusion investigation is dictated into the sufficiency of systems analysis and the theory underlying the method.

For those who scoff at the implied premise that threat can be measured, be reminded that the analysis of the "unanalyzable" and the conception of the "inconceivable" have given great impetus to the progress of mankind. Be also

¹⁶ 1970 Information Please Almanac, Atlas and Yearbook (24th ed., Simon and Schuster, 1969), p. 189.

reminded that concepts that are regarded as indefinable by the world's great intellects may imply the need to reorient the manner in which these concepts are regarded. The structure of a complex concept may never be discerned but the function of the concept in relation to the purposes of mankind may be very helpful indeed.¹⁷

For example, a definition of threat used in the Defense Department does not exist. Yet the Department uses functional relations to the concept of threat, which act as measures. These measures can then be used to justify expenditures in relation to the threat. The very essence of the problem discussed here lies in whether one may conceptualize threat. The problem of threat and the notion of its use as a primitive concept will be taken up later.

Systems analysis is initiated as a method because of the threat of impending competitive action. (This statement can be accepted if one disregards the troublesome area of threat definition.) The competitor in this case is a potential political enemy. System studies are also initiated to modify operational systems to take advantage of current developments.¹⁸ Of course, one hopes the systems of the Defense Department are generated in relation to potential enemy threats. Finally, systems analysis can be employed because of orders of decision-makers. One can safely say that the

¹⁷ Ackoff, op. cit., p. 171.

¹⁸ Rudwick, B. H., Systems Analysis for Effective Planning: Principles and Cases (John Wiley & Sons, Inc., 1969), pp. 14-15.

decision-maker in the Defense Department is probably (or at least should be) motivated by some form of perceived enemy potential to harm the United States. (To conclude then that all systems analysis activity is primarily based on some perceived threat is tempting, but quite naive. This paper will address this nexus between systems analysis and its initiation later.) This present discussion is biased toward the ideal that the defense establishment exists for the common defense of the United States. Using the word defense in this context necessarily brings to mind the word threat. Without threat one needs no defense and so on. What needs clarification here is that the Department of Defense is a human construction and organized and run by men. The Department's animation is a product of its organization and that organization's membership. The membership's interpretation of what the common defense entails is of interest here. This interpretation and the actions (in the guise of programs) used to carry it out result in national defense. It is clear then that no matter how one defines defense or threat, the true understanding of these concepts in the Department of Defense lies in investigating the actions of the Department to deal with them.

In the past the programs and plans of the Department of Defense have been scrutinized from every aspect. Discussion then centered on whether these programs and plans in fact accomplished the common defense and effectively coped with the threat to the nation. The planning, programming and

budgeting system has as its self-proclaimed purpose to equate projects to budget allocations and specific enemy potential. Critics seized on the comparison of these projects and their costs disregarding how they were generated. Congressional hearings go on today dealing with this very subject. The object of this discussion is to present the reader with the fact that today the justification of defense plans and programs is logically dependent on perceived threat. At this writing this dependency probably does not exist in a rationally reconstructable manner. In other words, can government planners equate existent and proposed systems to some threat via some reproducible method that can be followed by other individuals such that the same systems result? If this dependency does not exist then necessarily by the previously mentioned reasoning those same planners must not completely understand either the organization of the Department of Defense, its membership, or its actual functioning, or all three. To make a conclusion about the preceding statement is not the present object. The present object is to insure insight into the structure of the problem.

Setting aside the difficulties previously discussed concerning the understanding of the actual functioning of the Defense Department, the relationship of the United States to potential enemies is taken up. This relationship is the main problem. If researchers could dissect the organization and membership of enemy governments, learn of their functioning and its relationship as a potential threat to the United

States, the problem could be solved. Minimum expenditures could be arrived at straightforwardly to counter these threats. Unfortunately, our understanding of foreign establishments is as far away as respective foreign researchers are in understanding their own country's organizations and motives. (One must at least suspect this to be true if Defense Department planners have the sort of problems indicated in the last paragraph.)

Where is the starting point then? Does one wait until a systems study is indicated in relation to some vague potentiality to construct a theory of threat assessment to support the study? Can one equate political analysis of one's enemies to systems studies? What operational theorems does one have on which to fall back?

As previously implied no theory of inter-country relationships in rigorous enough format exists to construct inputs to systems studies. Many theories or disciplines, if you will, such as political science, deterrence theory, arms control and international relations exist, but they are incompatible with the present conduct of systems analysis. In fact, the controversy which exists between the aforementioned disciplines in regard to potential threats is chaotic. Leaving the perspective of the government establishment, one is accosted by pamphlets, articles, books, speeches, news reporting and all manner of voiced opinion relative to or purporting to assess potential threats to this country. The material available is staggering. Again, where is the starting point for systems studies in relation to this material?

At this juncture it is appropriate to discourse about principles or laws of science. A principle or law is a convenient way of recording a scientific observer's observations about some phenomenon. The activity of observing is a continuous one requiring reinterpretation of the principle or law or they must be discarded as no longer helpful. An analogy to demonstrate this definition is the one concerning the ancient belief that the universe was made of fire, water and earth. This principle suited man until classical physics and more recently nuclear physics dictated its complete refutation.

Now, similarly the laws concerning the behavior of countries presenting threats to the United States are constructs of the observer of these countries. Consequently, any laws of value, in order to remain valuable, must be capable of reinterpretation. To maintain one's laws one reinterprets. This methodological idea is credited to Kant who claimed that we would not observe regularity in nature, had we not first put it there.¹⁹ It follows that we would not observe regularity in countries' behavior had we not first put it there. Making a round turn the observation that completes this discussion is twofold. If one claims no laws of inter-country behavior, can one possibly observe this behavior accurately? Furthermore, can this behavior be observed with enough precision to be useful to system analysts?

¹⁹ Churchman, op. cit., pp. 234-235.

A recurring theme in the present section has been that the basic rigor of dependence on numbers and measurements of systems analysis makes this method incompatible with other disciplines that traditionally have handled threat analysis.

Quade and Boucher observe that:

Today, analyses no longer look as "analytical" as they did in the past. To an increasing extent they deal with strategy as well as with tactics--with the ability to achieve general foreign policy objectives, rather than merely with the ability of weapon systems to influence the character of a single military clash. . . . We now realize that the impact of subjective considerations--such as the system's flexibility, its compatability with other systems (some yet unborn), its contributions to national prestige abroad, and its effect on domestic political constraints--can play as important a role in the choice of alternatives as any calculation of war outcomes. In addition, we realize that such intangibles as the extent to which superiority in residual forces can be effectively used to coerce the enemy to discontinue the conflict or the perception each side has of its own or its enemy's strengths, must be taken into account. Thus, it should be no surprise that many of the component studies and even a major part of the over-all analysis, are verbal rather than quantitative in nature.²⁰
(Underscoring mine)

It must be submitted that these observations are essentially correct, but the embellishment of analysis with "verbal rather than quantitative" reporting methods is begging the question. Rigorous (analytical) results and the complete repetition of results by other researchers using a study's methods are in part the scientific method. Substitution of verbal analysis of threat in place of striving to develop methods to measure it, will never solve the measurement problem (or resolve it). Now analysts must wear two hats when dealing with threat

²⁰ Quade and Boucher, op. cit., p. 15.

assessment: one of a systems analyst, the other of a political scientist. Green [Ref. 7] is especially damaging to the reputation of systems analysts' ability to properly don the hat of a political scientist.

Quade and Boucher go on to cite Alton Fry:

However frustrating and difficult may be the attempt to perceive and project the probable intentions and behavior of a potential adversary, prudence demands that the effort be made. Only with some appreciation of the other side's motives and some notion of the underlying values which influence its decision-makers can we hope to induce behavior on their part that is favorable to us. . . . Obviously the policy-maker must use this kind of qualitative research and analysis with the greatest caution. Since all the important variables may not even have been identified, much less analyzed, In this world of subjective probabilities, of ill-defined and personally ascribed confidence levels, the investment of positions which cannot be scientifically verified may tend to distort the analytical contexts, to polarize discussion along artificial lines, and to pervert the entire process (of analysis) into sterile controversy. Both analyst and user must constantly guard against the inclination to form unjustifiably rigid convictions and to develop a false confidence that any particular model or solution accurately conforms to the real problems of politics and strategy.²¹ (Comments in parentheses mine)

The development of methods of identification of Alton Fry's "important variables" and measures of their ranges to an extent that policy makers could rely on systems studies dealing with "problems of politics and strategy" (or threat assessment) should be a major goal in systems studies. This goal should not be discarded because one is able to substitute

²¹ Fry, A., "United States Space Policy: An Example of Political Analysis," Systems Analysis and Policy Planning (American Elsevier Publishing Co., 1968), pp. 322-323.

a well-turned phrase for its accomplishment, or because "prudence" has not "demanded" convincingly. This goal should be striven for to further the horizon of the usefulness of systems analysis and its product to further the national defense.

All too often, the definition of threat is not taken seriously by scientists. The notion of threat as a basic and primitive concept in need of no definition can be accepted in one's everyday life only. At the level of national security threat, its definition takes on great importance. This nation felt threatened by Communism in Southeast Asia. As a result, fantastic sums were allocated to prevent the domino theory from becoming reality. In fact, at this writing fantastic sums are still allocated for this purpose.

"The content of (or meaning contained in) a definition should take into account the objectives of the researcher and common and scientific usage of the concept."²² Whether the "common and scientific usage" of threat can be provided at some universally acceptable level and embodied in a definition that accounts for this country's objectives in researching threat cannot be determined at this time. What is clear is that too many times this undertaking is poorly done if accomplished at all. If the reader will turn back to the first and second opening paragraphs in the introduction, he will perceive no definitions of threat by either Mr. Laird

²² Ackoff, op. cit., p. 174.

or Mr. Proximire. One will see a reliance on the notion of threat embodying some primitive understandable concept. This is in fact true. But can this nation base its expenditures for defense (to the sum of \$79 billion in 1969) on this notion? One would think not.

The present methodology dictates development of wide ranges or options at great expense without knowledge that any of these major weapon systems and national policy contingencies will ever be used.²³ The lead times of many of these systems are as long as ten years (due to the embodiment of wide ranging capabilities within each system for unknown contingencies, one would think).

The emphasis of Defense Department spending on the development of multi-billion dollar systems has an effect on a potential adversary. This effect is unknown, but most likely some effect does exist. The studies supporting these systems should deal with it. The analysis of this effect might serve to shelve complete development of the system once a desired effect, forecasted by the systems study, had taken place. The military tactician would call this tactic a feint. The effectiveness of military feints can be measured by the amount of enemy men and material committed to counter them. This particular notion and its use in systems analysis has great potential, but again rests on a greater understanding

²³ Hitch, C. J., Decision-Making for Defense (University of California Press, 1965), p. 75.

of threat as this country and its potential adversaries perceive it.

The purpose of this general discussion has been to uncover some functional relationships that give insight into threat assessment. (The structure of the problem of threat assessment is discussed in Section V.) This insight was intended to be accomplished by clarification, argument and explanation of major issues that concern the assessment of threat carried on today by system analysts.

B. NATIONAL GOALS

National goals and the values of the people of a nation are exceedingly difficult to define. Historically, it seems that the task fell to officials to voice these concepts to the satisfaction of the masses. In the United States men are elected to offices of great importance by their ability to voice what people want.

The difficulty that an analyst encounters in his quest of threat assessment is the relationship between threats and goals. Goals are constructed from values. A single goal may be constructed from a single value or an infinite number. A national goal, the goal that the majority of the people of a nation feel should be accomplished, therefore is made up from the many values possessed by this majority.

If national survival or the continuance of the culture, traditions and ideology of a nation is a national goal and if this goal is threatened by another nation tremendous sums

in lives, resources and money are paid to protect this goal. On the other hand, if national survival is not a paramount national goal and a foreign power threatens the culture, tradition and ideology of a nation, many times the protection of these concepts is adopted as a result.

One can see that values do make up goals but threats to previously unknown goals can motivate a nation's people to take up these threatened concepts and force their acceptance as national goals.

By this reasoning national goals embody the values of a people, or their leaders. Threats to national goals tend to make nations able to define these goals more clearly or adopt as national goals those concepts that seem to be threatened.

Why is this discussion presently mired in this sort of reasoning? It is because if one cannot somehow relate to analysts what the nation's goals are, it is exceedingly difficult for the analyst to accurately assess the threats to these goals. Further insight into the problem of national goals finds that analysts not only need to know what the goals of a nation are, but to what extent they are valued in relation to each other. If this is not known and the assumption is made that they are equally valuable then misallocation of resources to accomplish national goals result. For example, if the United States valued in a similar manner national survival and environmental cleanup, it would spend equal money, time and effort on them. (This example implicitly uses values as the mechanism to relate resources to goals.)

It is important that analysts find some mechanism that attributes values to goals (once national goals are defined) and the amount of threat to the most highly valued goals. This process will allow allocation of resources to protect these goals. This mechanism will help to solve the problem if it is remembered that defining national goals should be the starting point.

Contemporary scientists inherit tremendous aversion to the process of making value judgments or deciding what the people ought to value. If scientists concern themselves with what people actually do value, there is no conflict. If this can be done, it will lend tremendous insight into the creation of national goals. With these goals as a starting point, concentration of effort on assessing the threat to these goals can be accomplished.

Whether any of the concepts in the preceding discussion will be accomplished depends on future efforts to tackle these concepts. It is safe to say that the goals we value as a nation have yet to be determined. The threat to these goals is dependent on recognition of our goals.

An analyst who does not recognize the infra-structure of the problem of threat assessment and does not agonize over his assumptions concerning this infra-structure will be prone to think he has truly solved a problem, when in fact he has only compounded it by possible misallocation of resources or in any event, allocation of resources to personally ascribed goals assumed to be national goals.

C. MEASURES

In any discussion of scientific methodologies and their logic, necessarily one must discuss measurement. In systems analysis measurement plays an important role as it does in all scientific activity. Yet there exists no theory of measurement to guide practitioners. In fact, controversy centers over how measurements are made and their effect on the results of a given study. This controversy over measurement affects acceptance of a study and therefore, implementation of its recommendations.

The controversy over measurements prompts much of this investigation. For how can one measure such an ill-defined and complex concept as threat in such a situation? In this context, it was appropriate to discuss only the possible structure of measures of threat.

As a starting point, the establishment of the dimensionality of measurement of threat should be made. Scales (i.e., ordinal, cardinal, interval, nominal) for each dimension will determine the sort of mathematical operations that can be performed and to some extent the amount of information contained in each measurement of each dimension.

Once the dimensions (areas of interest) of the concept of threat are determined, the division into subregions of interest of the dimensions must be determined. After the concept of threat is refined to the point of understanding by dimensioning each dimension of interest one can visualize the interrelated concepts that characterize threat. A matrix

of $m \times n$ dimensions can be used for discussion. The m represents the number of initial characterizations of threat. The n represents the possible number of characterizations of each dimension. Now each element in this matrix can be another matrix of $m \times n$ and so on. For example, a potential enemy's threat to this country can be divided into three categories: economic, cultural and military. These categories can further be divided. For example, the economic threat can be divided into several more categories such as foreign trade, effect on world markets, etc. The foreign trade category can be further characterized by tons of goods exported, tons of goods imported, tariff barriers, and so on. The measures of the basic elements of these last matrices can be relatively simple. The question is now whether these basic measures can be related theoretically to the original matrix that was decomposed. The point of this example is that until a generally accepted theory of decomposing threat into basic, measurable concepts is accomplished one is reduced to assumptions and scenarios and other scientifically crude methods. (This point will be taken up later.) The intent is not to imply that these methods are wrong or less right than future scientific methods of measurement of threat. The intent is to state that they are not reproducible, that is, each is researcher-dependent. The extent to which one man using another man's methods achieves the same result determines the value of the method. (This country has deeply felt the loss of astute political scientists and diplomats over and over

again when less accomplished individuals tried to interpret world events. This loss was felt because the method of these men could not be used by other men to accomplish similar results.)

This discussion is not meant to imply that the quantification of threat lies in counting missiles or tons of shipping or whatever, although the quantification may well be contained in such an accounting. What is the intent here is to emphasize that the careful documented construction of a theory of measurement of threat is a requirement to any study that bases its results on the quantification of threat. What to be measured and in what manner is not, and can never be assumed to be a simple task.

D. RESOURCES

Before the advent of systems analysis and the planning, programming and budgeting management tool in the Defense Department, the President usually informed his Defense Secretaries of the amount of money intended for each department. The respective departments then maximized defense with respect to this budget ceiling. Now without arbitrary ceilings to limit the budget required for defense, the Defense Department attempts to support political objectives in an optimum manner.²⁴

²⁴ McNamara, R. S., "The Formulation of Political Objectives and Their Impact on the Budget," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), pp. 27-29.

The past discussion of measures and their importance was motivated by the fact that as a nation we are limited in the resources used in national defense. Resources such as manpower, natural resources and mental resources (the nation's will to accomplish a task, educated personnel able to perform complex functions or cope with complex problems and situations) are limited. The manner in which they are allocated helps construct the fabric of a nation's existence. If a nation emphasizes the manufacture of war materials it cannot produce as many consumer goods that require the same type of resources. If this country fails or is in error in its assessment of threat in relation to its national goals, the misallocation can be costly indeed in terms of the national resources.

The need to determine the magnitude of the error in threat assessment points up the need for a bench mark or index of defense level. Otherwise, the calculation of threat can be of no use in allocation. In the past, the tendency has been to plan to defend every possible imagined contingency given a budget ceiling. With possible threats ranging from future Viet Nams to sophisticated submarine-launched-multiple-warhead missiles, the defense against this total spectrum is too expensive without an index of defense level, say in terms of national resources.

The nation is faced with the problems confronting all modern, highly advanced industrial states such as environmental pollution, urban transportation, urban renewal, population

control and education. The defense of the nation must compete with these other areas that require the same resources. Could one reduce the spectrum of actual threats to this nation one could increase the spectrum of internal problem areas attacked with the resources that were destined for defense. At this time, no way exists to narrow the spectrum of threats perceived by this country. Indeed, no method exists to compute the cost in resources to this nation in defense against a single weapons system arrayed against it. Could this cost in resources be computed, it might prove to be too high. The nation might reconsider defending against that particular weapons system, or at least, the nation's defense planners might consider if the system were ever going to actually be used against this nation. In any case, an open-ended budgeting process²⁵ based on inexact allocation methods should not be tolerated in an environment containing limited resources.

E. DECISION-MAKING AND POLICY DETERMINATION

Alain Enthoven stated:

Do judgment and experience have no place in this approach to the choice of weapon systems and strategy and design of the defense program? Quite the contrary. The suggestion that the issue is judgment versus computers is a red herring. Ultimately all policies are made and all weapon systems are chosen on the basis of judgments. There is no other way and there never will be. The question is whether those judgments have to be made in the fog of inadequate and inaccurate data,

²⁵ Ibid.

unclear and undefined issues, and a welter of conflicting personal opinions, or whether they can be made on the basis of adequate, reliable information, relevant experience, and clearly drawn issues. The point is to render unto computers the things that are computers' and to judgment the things that are judgment's. In the end, there is no question that analysis is but an aid to judgment and that, as in the case of God and Caesar, judgment is supreme.²⁶

One must submit that the decision to "render unto computers the things that are computers'" is as important a decision-making activity as the decisions about the selection of strategies and weapons systems that are based on output from computers.

One may define the analysts' contribution in the defense establishment as improving the perspective of decision-makers and increasing their ability to react to changes in the environment in which they function. If analysts are thought of as decision-makers setting policies concerning their approach to scientific activity, the perspective they present to decision-makers is biased by the analysts' research decisions. It is accepted that the decision made by an individual who has been assisted by analysis is better in some sense than the decision made about the same situation without the benefit of analysis. It is probably clear that the method by which one acquires his information determines its value.

Acceptance of the criterion of having the maximum amount of information about a problem or situation leads one to

²⁶ Enthoven, A. C., "Choosing Strategies and Selecting Weapon Systems," A Modern Design for Defense Decision (The Industrial College of the Armed Forces, 1966), pp. 143-144.

naturally select decisions made with more information as better. Modern day Defense Department policy-makers depend on quality information. An efficient sorting and filtering of information into useful form is required. This is where systems analysts use their scientific approach and mathematical tools and their own decision processes. Thus, defense management has decided that some of the most valuable information is that produced by systems analysis. Furthermore, this decision was prompted because of the method whereby analysts go about their analysis.

What is the point? It is this: a method that allows its practitioners to make faulty decisions in its practice is not valuable. A study based on a threat assessment that is faulty deteriorates the quality of the decision or policy based on the study.

V. NATURE OF THE PROBLEM

A. GENERAL

"One should know one's enemies, their alliances, their resources and the nature of their country in order to plan a campaign."²⁷ So said Frederick the Great in 1747. The problem of assessing the threat of one's enemies certainly isn't new. In Frederick's time armies were formed to be used. Once one discovered that one's enemy had an army he could be sure that war would follow. Only the time and place of the initiation of warfare needed estimation.

Today threat assessment is complicated by the fact that most countries have standing armed forces. Many of these forces are equipped with weapons of awesome destructive power and have the ability to employ them within minutes. The cost of defense is related to how much threat one's enemies present and how much threat is desired to present to them.

In this age possessing weapons does not imply their use. The decision to use military power might then be construed to be threat. But if military power has no ability to prevent one from accomplishing one's goals it may not be threatening.

Dissertations concerning what threat is and is not are usually constructs of the writer's imagination. Arguments such as:

²⁷ Frederick the Great, Instructions for His Generals, trans. BGen R. R. Phillips (Stackpole Co., 1960), p. 24.

Let us realize that the threat itself represents the culmination of a decision analysis by the "opponent". From an innumerable set of variables, certain values have been extracted and collated in the specific threat. The threat is then the opponent's value representation of the interrelated decision processes of the threatened and the threatener.²⁸

are clever and seemingly correct. What is never clear in these arguments is how one arrives at such exact definitions and explanations of threat. If there in fact exists no method other than a self-survey of what a particular observer feels about how threat should be defined, systems analysts must be able to value these feelings in order to base analyses on them. At present the ability to value is not operational in the sense that the valuing process is reproducible.

The inputs to the Defense Department can be characterized as coming from various intelligence agencies, the State Department, the National Security Council, the President and Congress. The outputs from the Defense Department can be called national defense and characterized by programs, policies and plans supported by the defense budget. The problem of tracing any one input throughout the entire defense establishment and then noting its effect on the various outputs is staggering. (It may be that once this is accomplished, the action that the defense establishment takes on its various inputs would constitute the starting point whereby scientific

²⁸ Thompson, W. F., The Treatment of Subjective Factors in Threat Analysis (unpublished Master's thesis, The United States Naval Postgraduate School, Monterey, 1961), p. 29.

analysis of threat assessment could begin. Or ideally, these actions may be sufficient and the problem of assessing threat has in fact been accomplished.) Alain Enthoven described why the process of tracing any single input would be difficult in 1962:

To the extent that major national security policy problems are quantitative in character, calculations are relevant. Of course, there are many things that simply cannot be calculated; for example, the reliability of an ally, or the psychological and political consequences of a military operation. And these non-quantitative factors may dominate the problem. But there are also many things that cannot be done intuitively or based entirely on experience. Intuition and experience unaided by calculations will not tell us how many ICBM's are needed to destroy a target system, nor will they tell us how many C-141's are required to move a division. For most of these questions, a mix of calculations, intuition, and experience is required. One of the biggest challenges facing us today is how to find ways of blending these factors better in those areas in which unaided calculation is weakest.²⁹

This system description is crude but of sufficient detail to adequately describe what goes on today in the Defense Department concerning the assessment of threat. Because no manner exists to value these assessments scientifically, the error involved in this process is unknown. No presently reproducible method of threat assessment exists, what does exist are ever changing methods used without benefit of a theory or even crude operational theorems. The methods used are the preference of individual decision-makers and analysts.

²⁹ Enthoven, A. C., "Operations Research at the National Policy Level," A Modern Design for Defense Decision (The Industrial College of the Armed Forces, 1966), p. 158.

Since analysts are faced with developmental problems when dealing with assessment of threat it seems plausible that a thorough knowledge of the history of epistemology and the theory of knowledge would be part of their interests. It is not so in general. Professional philosophers on the other hand, possess the knowledge of these subjects but know little of present day science.³⁰ Consequently, the attempts at construction of theories and/or methods by analysts often times fail to include the results of past methodological inquiries.³¹ This lack of rigor confounds the problem of assessing threat with that of theory construction. Could this breach be narrowed by both philosophers and analysts much progress could be made in just the establishment of a method of communications between these two diverse professions.

The various inputs that the Defense Department received when characterized as a system present a problem to analysts. For example, if an analyst receives an assessment of the Middle East situation from the State Department couched in their own unique jargon, it would be extremely difficult for the analyst to re-examine this assessment, select and value the pertinent variables relating to his analysis without specific knowledge of how the appraisal was made. Implicitly, the State Department values its information. This valuation is not reproducible in a scientific sense either. Faced with

³⁰ Ackoff, op. cit., pp. 27-28.

³¹ Ibid.

this dilemma the analyst usually uses his own "mix of calculations, intuition, and experience as required."³² Whether this "mix" has a debilitory effect on the original State Department assessment is unknown. In light of this example, the need for a method of valuation of inputs to defense analysts is confounded with the problem of threat assessment by these same analysts. Obviously, much of threat evaluation lies in working with present inputs to Defense Department channels (possibly all threat may be assessed by using present inputs) but until a systems analyst truly understands what an Under-Consul in Haifa meant by "awesome ability to conduct war," for example, one must assume the analyst will impart his own particular interpretation to this phrase.

B. THE LACK OF A GENERAL THEORY

The problem of choosing strategies and weapon systems is a unique problem requiring a method of its own. It is obviously not Physics or Engineering or Mathematics or Psychology or Diplomacy or Economics, nor is it entirely a problem in military operations though it involves elements of all of the above. Because it involves a synthesis of the above-mentioned disciplines and others, it requires the cooperation of experts in all of these professions and many others. It is a not infrequent error, made by civilians and military alike, to identify defense planning uniquely with one of the above professions or disciplines.³³

³² Enthoven, A. C., "Operations Research at the National Policy Level," A Modern Design for Defense Decision (The Industrial College of the Armed Forces, 1966), p. 158.

³³ Enthoven, A. C., "Choosing Strategies and Selecting Weapon Systems," A Modern Design for Defense Decision (The Industrial College of the Armed Forces, 1966), p. 138.

It is not easy to tell someone how to carry out a systems analysis. We lack an adequate theory to guide us. This must be expected, for systems analysis is a fairly new discipline, and history teaches us that good theory usually comes late in the development of any field and after many false starts. Where the attention of systems analysis has turned to methods, it has focused mainly on the development of mathematical techniques for handling certain specialized problems, common in the practice of operations research--rather than on building a basic theory for the treatment of the broad questions typical in defense planning The more important philosophical problems such as occur in providing assurance that the model is meaningful, in devising schemes to compensate for uncertainty, or in choosing appropriate measures of effectiveness, still remain troublesome.³⁴

The result of the installation of systems analysis at the National Policy Level in the early sixties has been to assume in many cases that the application of methods used by individual analysts were valid because of the operational nature of the Defense Department. Systems analysis as a discipline in relation to the development of an adequate theory is like a leaky boat at sea. The boat needs dry docking and re-caulking but it still needs to carry out its mission. Pumping and underway repair go on at sea without a course change to a repair facility. Systems analysis is in use today. It produces answers that are in need of a theoretical back-up. The assessment of threat is an important step in this theory development because once a threat estimate is made the remainder of the analysis is built upon this foundation. A contention of this paper is that a recursive theory-building process should start with the assessment of threat. Once

³⁴ Quade and Boucher, op. cit., p. 18.

this assessment problem has been resolved the construction of an adequate systems analysis theory might follow.

C. THE ROLE DISORIENTATION OF ANALYSTS

The question of what discipline or what group should properly address the problem of threat assessment is moot. This deprivation of practical significance of this question comes because the construction of a method should precede the assignment of the method to a discipline. But yet the construction of a method to accomplish something is biased from what perspective the construction takes place.

Political scientists may already claim the ability to assess threat yet their method cannot be used by systems analysts not knowledgeable of their discipline. Methods constructed by a particular discipline usually are constructed for use by members of the peculiar discipline. (At least historically this has been the case. A case in point is mathematics. Mathematical techniques that were obscure five hundred years ago have recently found use in other disciplines. The disciplines involved usually had gained enough mathematical rigor over the years for proper communication with mathematics.)

Since systems analysis as a discipline is relatively new and has developed from other considerably advanced disciplines (Mathematics, Mathematical Economics, Engineering and Physics, to name a few) the channels of communication to less advanced, less rigorous disciplines in the behavioral-social-political complex of disciplines are few. This causes the typical systems analyst to endeavor to make these disciplines

fit into his particular schemata of analysis. Oftentimes this results in misstatements about the exceedingly complex structures which make up the phenomena with which these social sciences deal. With these oversimplified problem statements as a foundation systems analysts build up their own exceedingly complex scientific analysis until one must question the value of the analysis. [See Green, Ref. 7].

The crux of the problem here is what this paper terms role disorientation. Because the analyst is asked by decision-makers to deal with problems that in the past were nominally dealt with by social disciplines, the analyst attempts to answer these questions. The result is oftentimes catastrophic. Not only does the analyst embroil himself in areas of other disciplines where he may not be well versed, but he may present such well ordered, logical and complete arguments considering his assumptions that the decision-maker is forced to arrive at the analyst's conclusion also. In other words, by his clean-breast technique of dealing with normally complex phenomena the analyst assumes the role of the decision-maker or policy-maker. (Scenarios play an important part in these predictive arguments and are probably the worst methods used by analysts in light of oversimplification.)

Measurement plays an important part also in the furtherance of role disorientation. The involvement of Systems Analysis included inputs from Industrial Engineering, Operations Research, Economics and Physics among others. If one

accepts the observation in relation to measurement that physical scientists at one end of the spectrum are concerned with problems of measurement arising from accepted models, and if one accepts also that social scientists at the other end are concerned with problems of measurement arising from proposed empirical studies³⁵ it follows that systems analysts can be concerned with the complete spectrum. With no general theory of measurement to guide all scientific effort, it is plausible that the measurement schemes used by the physical scientists and behavioral scientists would be of interest to systems analysts. The import of the discussion is that analysts construct their own methods of measurement without consulting other theorists with similar problems.

The lack of effort that the discipline of systems analysis puts forth in the assessment of threat may be due to its members' basic acceptance that the measurement of threat is impossible in a manner suitable for analytic studies. Questions of whether the discipline is organized to carefully construct an accurate and relatively precise method of threat measurement are answered in the negative. This seems to allow oversimplification of the complex phenomena of threat. It is assumed that the structure or its functional relation cannot be outlined. This is again role disorientation, because the organization of systems analysis is based on the

³⁵ Churchman, C. W. and Ratoosh, P. (ed.), Measurement: Definitions and Theories (John Wiley & Sons, Inc., 1959), p. vi.

claim of considering a problem in relation to other interacting areas considering spillovers and the construction of theoretical bases to adequately describe or predict the problem solution. One must submit that the organization of the discipline is eminently suitable for going about threat assessment, but it should not go about this task in relation to a single study. The fundamental effort needs to be in construction of a general method such that individuals can then tailor the results of the application of the basic theory to his own needs. Ideally, one should practice systems analysis by applying the methods of other disciplines instead of constructing new methods of analysis. Certainly, one practices without tampering with the theories on which the methods are based. Yet as previously discussed oversimplification of theoretical bases results when systems analysts attempt reinterpretation of other disciplines' methods of dealing with threat.

D. VALUE JUDGMENTS

National Defense Policy is generated by the interaction of value judgments and the costs of military forces and weapons systems.³⁶ That these judgments are recognized as part of the nature of systems analysis is not clear. Preference for standing back and pointing out to decision-makers the results of their analysis is the image of systems

³⁶ Enthoven, A. C., "Operations Research at the National Policy Level," A Modern Design for Defense Decision (Industrial College of the Armed Forces, 1966), pp. 155-156.

analysts; when in fact, the analysts implicitly value variables in models by singling them out of problem situations. This sort of valuation by analysts during threat analyses may cause an opponent to be much more threatened than he actually is or vice versa. What is pointed out here is the importance of determining the actual threat. In the interim, explanation as to how one values must be included in analyses with other assumptions. Otherwise decision-makers will assume a particular analyst's value system to be valid when actually it may be fallacious or incapable of selecting an accurate estimation of the situation. In this case it must be the decision-maker's prerogative to set the level of threat for particular analyses.

Analysts presently do not involve themselves with specific statements about value and its relation to threat. It is exceedingly difficult to formulate National Policy without counting arms, men, systems and dollars, i.e., using the relevant numbers³⁷ but it is senseless to manipulate these numbers analytically without proper qualifications of why they need manipulation. Until someone qualifies why one should endeavor to undertake an analysis, the finished analysis can never be optimal in any sense. For a study to be optimal one must have something to optimize. In this paper, the something can be termed "optimizing how the defense

³⁷ Ibid.

establishment handles the National Security after finding what level of threat it faces to secure against." Present studies seem to optimize handling of National Security given a level of threat. If threat is continuous this implies an infinity of possible optimal solutions.

Emphasis on what valuations took place in a study imply no consideration of variables not included in the study. This sort of method implicitly places zero value on the possible variables that were not included. In the ethereal world of threat the setting down of the valuations one makes subconsciously is impossible. The exhaustive listing of the conscious decision process is not that difficult. The partial listing is less arduous. A study should attempt to take up this task to prevent basing a scientific effort on an unspecified foundation.

E. THE TRANSLATION AND INTERPRETATION PROBLEM

Much of this paper has been concerned with the lack of a sufficient method to quantify threat. There exists methods that attempt the assessment of threat. (See Section VI) They suffer from a common factor. The methods do not embody a complete-enough translation of the concept of threat.

The people of the United States deal with a concept of threat that is different than the one with which their Government labors. The problem that rears-up is that of analytical translation and interpretation of individual concepts for use in an analytical context. For if a study does not conceptualize threat in a manner that accounts for the

various concepts that these individuals characterize one cannot visualize the optimum provision of the common defense against these felt threats.

The natural question following is, how does one know that these individuals really know what the threat is? The retort is that this source supplies the budget that supports the defense effort. The job of defense as this paper sets forth is either measure the threat or quantify what is felt by those individuals supporting the defense establishment.

To make the translation problem clearer an example is used. Prior to the present abilities to plot the courses of tropical storms or hurricanes the best defense against them was to cause whole sections of the coast thought to be threatened to dig in, board up, and so forth. If the anxiety, shovels, ulcer pills and other sundry items used, could have been costed, one feels that the amount would have been tremendous. This cost stilled the fears (or perceived threats) of the individuals involved. Once the actual threat could be calculated by weather satellites and aircraft the cost was hopefully cut. Presently, defense analysts possess no methods to quantify threat and they endeavor to calm their own fears, not the fears of the threatened people of the United States.

This problem is not just inherent in the relationship between the taxpayers of the Nation and analysts. More importantly to the analyst it exists between himself and the decision-maker he serves. Possessing no adequate method to

handle threat, the analyst usually turns toward what his decision-maker perceives. Then he must translate this perception into understandable terms to proceed with the study. The question again arises as to the validity of the decision-maker's perception of threat.

This translation problem is a deceptively simple concept but exceedingly difficult to resolve. To resolve this problem can be no more difficult than the resolution of the threat assessment problem, and intuitively much less fruitful. The translation problem disappears once threat assessment is accomplished.

F. INTERFACE PROBLEM

One of the maxims of the conduct of systems analysis is the extreme importance of the analyst interfacing with his decision-maker. This interface action cannot be properly accomplished with a staff or a directive. Yet one can dare say that singling out ten important decision-makers at the level of National Defense, that is the level of the National Security Council, that these men never personally espouse their ideas of perceived threat to analysts in the Department of Defense. Yet analysts using policy directives must translate this guidance without benefit of a give-and-take discussion. One may argue that this interface is not practical at this level, that these men are too busy. The answer is then, restate how systems analysts must operate at this level. The decision-maker acting on a study today is not allowed the knowledge that the study is a translation, a personal one

peculiar to the systems analyst that constructed it, and the study cannot reflect the personal perspectives of the decision-maker.

The development of a method of practical interfacing of analysts and appropriate decision-makers is paramount to the solution of proper threat assessment. It cannot be perceived that a method of quantifying threat can be accomplished without intimate access to the decision process.

G. SCENARIOS: THE ASSUMPTION OF THREAT

The classic vehicle for systems studies is the scenario.

It appears that the phrase, "Now this is a scenario . . .," can be found to be variously applied to

- An outline of a sequence of hypothetical events;

- A record of the actions and counteractions taken by parties to a conflict;

- A plan of actions to be taken during a projected exercise or maneuver;

- The estimate of the situation by Commander "X" at time "Y" in a war or war game;

- A specific set of parametric values selected for a given run of the computer.

How, then, can we proceed to talk about "scenarios" without excluding someone's notion of what scenarios really are?

If we dwell for a moment on these various notions, we do find a common thread. They all refer to descriptions of the conditions under which the systems they are analyzing, designing, or operating are assumed to be performing. The system may be a weapon, it may be a component of a weapon, it may be a vast complex of weapons and support facilities (such as NORAD), it may be an organization (such as the National Military Command and Control System), it may even be the entire national security establishment. Whatever the scope and properties of the specific system, a scenario-in systems analysis-can be defined as a statement of

assumptions about the operating environment of the particular system we are analyzing.³⁸

Creation of a scenario (for general nuclear war) is one of the most difficult aspects of systems analysis, and calls for great imagination on the part of those concerned with predicting how a system may be used at some future time. The analyst obtains information regarding possible scenarios by discussing such possibilities with different decision-makers and operational personnel, each of whom may have one or more environmental situations in mind. Thus, there will probably be no uniform agreement on any one scenario, and the analyst may be forced to deal with a wide range of possibilities. Incidentally, this is a common problem which the analyst also must face in gathering data which involves the intuitive judgment of others. . . . the analyst copes with these uncertainties, particularly in the early phases of the analysis, by making explicit all data and information he uncovers including contradictory opinions.³⁹
(Parentheses and underscore mine)

The scenario drives the analysis effort. The scenario is a method whereby analysts detour around the problem of threat measurement. Precise statements using "great imagination" neatly sidestep the problem. If a decision-maker did not agree with a particular scenario the study was a failure. More importantly, if the scenario did not parallel reality the study was a failure.

A scenario is a highly complex series of assumptions about the future with no theory of scenario construction with which to guide its writer. Scenarios are assumed levels of

³⁸ Brown, S., "Scenarios in Systems Analysis," Systems Analysis and Policy Planning (American Elsevier Publishing Co., Inc., 1968), pp. 299-300.

³⁹ Rudwick, op. cit., p. 102.

threat. Analysts allow optimum solutions to be generated in relation to these levels. For every level of threat (or scenario) one has an optimum solution.

Present state of the art considerations dictate the use of scenarios. These imaginative schemata of the future could be discarded with the advent of a methodology for threat assessment.

H. TEMPORAL CONSIDERATIONS

The estimation of threat concerns one with an area that has fascinated man in the past and still does today. It is the prediction of future reality. There are many predictive problems that have been solved at least to the extent that mankind can derive useful information from the answers. Tides come in and out on schedule and the moon moves as predicted allowing the United States to place men on it. The basic structures of myriad predictive phenomena are well understood today. Reality can be defined as the total environment, perceived or not, of man. (Because a man does not know a nail awaits his tire on the road ahead, does not disallow the man from having to cope with the flat tire.) Future reality is this same environment after a passage of time. Analysts are not concerned with the effectiveness of weapons systems or policy decision in post hoc operational analysis. They are concerned with future effectiveness of a system or policy in a future reality.

Presently, a five year lead times for system development are common. Policy decisions depend on capabilities on hand

and anticipated. Systems whose development start today may influence policy five years hence. Policies today may modify systems tomorrow. These interactions plus present and future threats, dictate the nature of the problem with which analysts must work.

The ability to quantify threat today without development of methods to push these quantifications into the future will invalidate studies that are not related to future time periods. A particular analysis that is absolutely correct in one time period may be entirely wrong in another.

The ability of individuals to objectively predict future threats without confounding these future predictions with present reality is exemplified in history. The generals at Verdun misinterpreted, to the tune of a million casualties, the deadliness of barbed wire obstacles covered by rapid-firing machine guns, the battleship admirals never dreamed of aircraft sinking capital ships, and the French at Dien Bien Phu knew that the Viet Mihn could not employ artillery on a mountain side. History suggests that a temporal threshold exists with regard to threats, weapons systems and policies. The temporal thresholds for threat predictions, major policies and weapons systems effectiveness has not been investigated.

I. UNCERTAINTY

The ability to assess threat can be valued by examining what difference a potential ability to accurately assess threat would make in the defense establishment. If one could

accurately assess threat it seems plausible that systems could be built in a more specialized manner rather than with multiple capabilities. Policy pronouncements could take on special meaning instead of being couched in phrasing that is very general and difficult to interpret. The potential savings in time, effort and resources by precise threat assessment should be substantial. Presently, by necessity, the Defense Department must pronounce general policies, construct far-ranging programs and develop systems with multiple capabilities to counter vaguely perceived complex threats. This status quo results in cost in resources.

J. DEPENDENCY ASPECTS OF UNCERTAINTY ASSOCIATED WITH THREAT

The uncertainty associated with threat can be dependent on several aspects. Two of these aspects can be termed the knowledge or facts that are presently known and the risk of delaying to obtain more information.

Suppose for example, one could associate an uncertainty range to the threat imputed to a United States policy A. Assume also that the knowledge one has concerning policy A has an uncertainty range associated with it. It is plausible to assume that there exists an uncertainty range concerning the risk of delay to find out more knowledge about policy A. Suppose further that policies B, C, D, and E also somehow affect policy A. Policies B, C, D and E may be policies of the United States, its allies, its enemies or a mix of all three. Suppose also that there is a range of uncertainty associated with the knowledge one has about B, C, D and E.

and the risk of delay to find out more knowledge about these policies. One could go on about weapons systems both friendly and enemy that affect policy A and describe the ranges of uncertainties that affect the knowledge and the risk of delay in acquiring knowledge of these weapons systems. It will be assumed here that weapons systems X, Y and Z somehow affect policy A. It suffices to say that the uncertainty range of the threat associated with policy A is dependent on the knowledges, risks and uncertainty ranges of the knowledges and risks of not only policy A, but policies B, C, D and E and weapons systems X, Y and Z.

It seems from the past example that a threat uncertainty range associated with a particular type conception is possibly dependent on a whole host of other uncertainty ranges. In the simple discussion above only two aspects of uncertainty associated with policy A were assumed (knowledge and risk of delay in acquiring knowledge). There were only two different dimensions (policies and weapons systems) that were assumed to affect policy A through these aspects. The example gives one sixteen different uncertainty ranges affecting the threat uncertainty range associated with policy A.

Given one is concerned with the threat uncertainty range associated with a concept and that there are m aspects (i.e., knowledge and risk) to the uncertainty affecting the concept and n dimensions (i.e., five policies and three weapons systems) of these aspects one can consider m n uncertainty ranges affecting the concept's uncertainty range.

The dependency aspect of uncertainties probably could have tremendous potential effect on reducing costs in resources. For example, if one arrives at the conclusion that threat uncertainty ranges could be constructed (as previously discussed) these ranges should probably be related to units of cost to be useful.

If policy A's threat uncertainty range (in cost units) depends on m n other threat uncertainty ranges (in cost units) it seems that a narrowing of these ranges affecting policy A would reduce the range of uncertainty associated with policy A, thereby reducing costs. If one reduced all ranges to points, it seems plausible that the threat uncertainty range of policy A would either be reduced to a single point or to its minimum range and therefore its minimum cost.

It is clear that uncertainty costs. At this time, it is not clear how much it costs because the implied functional relationships previously discussed have not been discovered (although most analysts suspect their existence).

K. FIXED UNCERTAINTIES-SCENARIOS

A scenario (see footnote 38) as traditionally used by systems analysts implicitly fixes threat uncertainty ranges. That is (reference to the example of Section J. above) given m n threat uncertainty ranges affecting a concept and the concept's associated uncertainty of threat are characterized utilizing a scenario, one must necessarily fix the m n uncertainty ranges affecting the concept one is interested in investigating.

A scenario has the advantage of allowing analysts to handle threat. For the purposes of this paper the use of scenarios is disregarded due to their inability to handle the dependency aspects of uncertainty ranges associated with threat. Scenarios allow these variables' values to be selected in a manner that places no confidence in them other than the confidence one has in the analyst who makes the assumptions. In other words, whatever the scope and properties of a particular system or policy, a scenario-in systems analysis-can be defined as a statement of assumptions about the operating environment of the system or policy.⁴⁰

A scenario, while being a useful first approximation, depending on the imagination of the scenario creator, has no method whereby confidence levels or probabilistic statements can be associated to it in a scientific manner. If one agrees with or likes a particular scenario one goes along with the analysis based on the scenario. If one does not agree with the state of the world as perceived by the scenario writer, the study is invalid.

L. TIME VARIABLE SCENARIOS

Some scenarios utilize what economists call state parameters. That is, once a particular range of uncertainty is selected and optimum procedures conducted in analysis, the investigator then varies the range of uncertainty arbitrarily.

⁴⁰ See footnote 38.

The parameterization of state variables (uncertainty ranges associated with threat) assumes a particular relationship between the uncertainty ranges of the variables that affect the particular state parameter.

When analysts endeavor to make scenarios time-dependent by variation of uncertainty ranges of threat they make unknown assumptions about the variables on which these ranges depend.

Further and deeper dissection of the nature of threat and the ranges of uncertainty one is able to associate with threat needs to be accomplished. At present the problems of uncertainty cannot be handled over time because scientists as yet have not determined how the functionals discussed in Section J. should be formulated (if they exist at all). One is now able to complete a systems study given a specific threat (i.e., a scenario). But once threats have uncertainty ranges associated with them, multiple optima can be associated with the ranges. These multiple optima dictate large multipurpose systems and general, all encompassing, policy formulations which cost in resources.

M. RECOGNITION OF UNCERTAINTIES ASSOCIATED WITH THREAT.

Rudwick tells the reader in his book:

Analyzing competitive uncertainties. Here the key question to be addressed is, "What are the various strategies and tactics that the competitor (enemy) can employ, at what strength, and what impact will these have upon the effectiveness of each of the system alternatives being analyzed?" Perhaps the most important aspect of dealing with competitive uncertainty is recognizing that it is an important problem. This may seem obvious, but many systems analyses and systems

planning efforts are deficient because it is assumed that the competitor will act in only one assumed way.⁴¹

The recognition problem associated with threat uncertainties is fundamentally more complex than Rudwick lets on and cannot be simply handled by "recognizing that it is an important problem."⁴²

The recognition problem is not only concerned with what an enemy can and will do with his various assets; more fundamental and important, it is also concerned with the ability to continue to recognize the change in an enemy's threat attitude toward us once we as a nation attempt to counter or neutralize an enemy threat.

This ability is not accomplished as Rudwick states by assumption. As this paper points out this ability cannot be accomplished by scientific method at present. The social sciences make much of their ability to observe and predict, but until their results can be stated in a meaningful manner, understood by system analysts, the recognition of changing threats remains "an important problem."⁴³

N. PROBABILITY AS AN ADEQUATE CALCULUS OF UNCERTAINTY ASSOCIATED WITH THREAT

Today there exists two theories of probability. The first and most widely used is the probability that is found

⁴¹ Rudwick, op. cit., p. 193.

⁴² Ibid.

⁴³ Ibid.

in set theory. The second can be said to be constructed from psychology or social psychology.⁴⁴ This paper terms the former theory mathematical or set-theoretic probability. The latter theory is called subjective or qualitative probability.

Mathematical probability or set-theoretic probability depends on the ordering of some reference class into classes. Together with the theory of random numbers mathematical probability provides a method to measure probabilities in a standard fashion.⁴⁵

Subjective probability depends on the qualitative judgments of men. That is, probabilities between zero and one are solicited from men through some method to determine probabilities associated with interesting phenomena. (Usually those phenomena that cannot be logically related to a set-theoretic probability measure.)

The clear need for a probability measurement is not contested here, although the nature of threat is difficult to determine when related to the probabilities discussed. The nature of the problem of threat assessment bears out this observation. Analysts attempt to cope with threats that may be of a set-theoretic nature in a general historical sense but not exactly. Some threats may seem unique (that is not of a class of threats) but can in some manner be related to

⁴⁴ It is not the intent here to discuss probability theory for those readers uninitiated with respect to the calculus of probabilities.

⁴⁵ Churchman, op. cit., p. 138.

mathematical probability measures and not lie completely in the realm of subjective probabilities.

If one attempts to associate the statement "there is a probability of war of .5" to a probability measure, which measure does one choose? Is the .5 from mathematical probability worth or valued the same as .5 from a subjective probability measure? Can one class anticipated war into the class of past wars? These questions are the prelude to a most important question. Are present probability measures adequate calculi to use in threat assessment? Obviously, the probability associated with the failure of the Bay of Pigs Invasion is not the same probability associated with the failure of a missile launch as probabilities are theorized today. Yet the probabilities that one associates with these two diverse events probably must be used in the assessment of threats.

Present analytic techniques weigh subjective and mathematical probabilistic notions equally. This equal weight is certainly not bound up in scientific theory. Unless serious effort is attempted concerning the most feasible method to use these two diversely developed probability measures, studies using both measures surely have no meaning.

One must concern himself with whether mathematical probability can ever convey meaning in decision-making problems made under conditions of uncertainty. One must also question the sang-froid statements made by experts predicting outcomes of complex phenomena relating to threat assessment.

(One last remark is appropriate. There exists notions that a probabilistic world is in fact extant, in spite of mans' inability to perceive it. This notion must be refuted because it cannot be defended. No manner exists to refute it. That is as Kant set down in his thesis: facts or data are not moves of nature; they are in part moves of mankind forever colored by man's observatory facilities.⁴⁶ That is can mankind understand some concept completely if it is not the product of mankind himself? This is doubtful.)

O. SUMMARY

Threat assessment is a complex and immensely complicated problem today. The problem of properly identifying and then assessing threats to this country is magnified in this era of standing armies and almost instant communication.

Historically, possessing weapons almost invariably has led to their use. This is passé primarily due to the awesome destructiveness of modern nuclear, chemical and biological weapons and their highly accurate and dependable delivery systems. It seems that countries cannot afford to withstand the second strike capabilities of their enemies.

The notion of threat is a primitive one which is partially understood by all men but definable by none. Today no generally acceptable definition exists that allows one to attempt measurement of the concept of threat. In addition, no method is operational to value predictions about threats present

⁴⁶ Churchman, op. cit., p. 168.

and/or future, that is operational to the extent that errors can be detected and associated with threat predictions.

The process whereby present Defense Department analysts assess threat has not been documented. Research indicates that if these methods were discovered they would be without benefit of a theory or operational theorems.

Analysts oftentimes fail to include the results of past methodological inquiries in their construction of theories and/or methods. This failure is due in part to the wide communications abyss between analysts (knowledgeable of present day science) and professional philosophers (possessed of knowledge of the history of epistemology and the theory of knowledge). This communications problem not only exists between philosophers and analysts. It is a salient feature of the relationship between traditional threat assessment agencies and defense analysts.

Systems analysis is in use today producing answers that are in need of a theoretical back-up. The assessment of threat is an important step in this theory development because once a threat estimate is made the remainder of the analysis is built upon this foundation.

The analyst attempts to solve problems that were nominally dealt with by social disciplines in the past simply because the analyst is asked by decision-makers. Thus, role disorientation results when the analyst embroils himself in areas of other disciplines where he oftentimes oversimplifies. Through this oversimplification technique, the analyst usually handles complex phenomena nicely. So nicely, in

fact, that he convinces his decision-maker of the merits of his study. Therefore, the analyst inadvertently assumes the role of decision-making.

Concerning measurement, systems analysis generally has not benefited from other disciplines with similar problems. Analysts usually construct their own methods of measurement without use of previous work in the particular area in question.

National defense policy is generated by the interaction of value judgments and the costs of military forces and weapons systems. It is not clearly understood that these judgments are in part the nature of systems analysis. All too often analysts shy away from statements of how they value concepts. Without lucid explanation of how one values to accompany one's assumptions, decision-makers are denied the act of assessing the validity of any system of valuation.

Presently rhetoric is generated concerning what is best for the American people in relation to their defense. The translation problem associated with what is best for their defense has not been resolved. Once threat assessment is accomplished the translation problem will disappear.

High level defense decision-makers must use analyses without knowledge of how they were constructed because of inadequate interface with the analysts who serve them. The decision-maker who acts on a study is not allowed the knowledge that the study is a translation, a personal one peculiar to the systems analyst who constructed it. Therefore, the

study cannot reflect the personal perspectives of the decision-maker because of the lack of interface with the analyst.

The classic almost irreplaceable vehicle for systems studies is the scenario. The scenario drives the analysis effort. Scenarios are assumed levels of threat. For every level of threat (different scenario) one has a different optimal solution.

Today the ability to quantify threat without development of methods to push these quantifications into the future will invalidate studies that are not related to future time periods. Without proper temporal considerations a particular analysis that is absolutely correct in one time period may be entirely wrong in another. History suggests that a temporal threshold exists with regard to threats, weapons systems and policies. These thresholds have not been investigated.

The defense planner is concerned with uncertainty and the ability to handle it properly. The dependency aspects of uncertainty are difficult to perceive. Until it is possible to perceive how dependency functionals are constructed, uncertainty will cost. How much uncertainty costs cannot be presently determined. Scenarios implicitly fix threat uncertainty ranges. For the purposes of this paper the use of scenarios was disregarded due to their inability to handle the dependency aspect of uncertainty ranges associated with threat. The recognition of uncertainty associated with threat remains a difficult problem. Further investigation into claims made by the social sciences is merited.

Probability in both its set-theoretic and subjective forms is now used in present assessment and each is weighed the same. Unless serious effort is attempted concerning the most feasible methods to use these two diversely developed probability measures, studies using both measures are surely inconsistent.

VI. METHODS

Section VI of this paper concerns itself with five methods that attempt or can be used to assess threat. These five methods do not form an exhaustive list of methods; rather these methods that exist in relation to threat are representative of particular philosophic standpoints (or perspectives).

It is anticipated that if a method of threat assessment could be constructed for use by analysts the method would draw information from the five perspectives dealt with in this section. Four of these five areas merit investigation, the fifth area is the systems analytic approach.

The purpose of this section is to briefly present a general outline of four of the methods and make only brief comments about the fifth method.

A. THE POLITICAL-MILITARY METHOD OR THE METHOD OF ASSUMPTION AND EXPOSITION

Examples of this sort of method of threat assessment can be found in many sources. The most noteworthy are found in The Naval Institute Proceedings, Brasse's Annual, The Army Magazine, The Military Review, Foreign Affairs and The Marine Corps Gazette. In addition, political-military commentators of major newspapers and major communications networks practice this type of method. There are also numerable books filled with this type of analysis.

The political-military perspective usually takes a hypothetical aspect of threat and then spins out logical

consequences from this impressionistic basis. This method is rhetorical in that it aims at convincing the listener or the reader of the author's point of view. The following examples of this method represent typical political-military threat assessment methods. (The following examples happen to have been taken from the 1969 volume of Brassey's Annual.)⁴⁷

From an article entitled, "The Defense of the Central Region of NATO" comes this example:

The Threat. There is a substantial body of opinion in high-level United States official circles which suggests that NATO has for years been substantially over-rating the Soviet threat to the Central Region and the Soviet superiority in conventional forces in particular. Former Defense Secretary McNamara in a testimony before Congress tried to point out that assessments of the Warsaw Pact land-air order of battle were conceived on far too narrow an analyses. He indicated that a great many factors, other than purely manpower, had to be taken into account such as training, equipment, reserve strengths, etc., before a true assessment could be made. The McNamara intervention came at the time when the previous U.S. Administration was working hard to persuade European countries to increase significantly their conventional forces in order to give time for nuclear decision-making, and that given a reasonable increase the Soviets could be held by conventional means alone. Whilst there may be some sense in the McNamara view that NATO should analyze the Soviet-Warsaw Pact order of battle more professionally, there is no getting away from the fact that with the amount of force at the behest of the Soviets, and accepting they would be the aggressor, there is no doubt that they could produce a crushing superiority of force at a time and place of their own choosing.

⁴⁷ Moulton, J. L., Barclay, C. N. and Yooe, W. M. (ed.), Brassey's Annual The Armed Forces Year-Book 1969 (William Clowes & Sons, Ltd., 1969).

There is another aspect of the threat worth considering, and it is that the Warsaw Pact as a whole are operating Russian equipment—a useful common denominator when compared to the hotch-potch available to NATO. So the overall threat remains, regardless of how the figures are maneuvered. In a speech earlier this year at Munich, United Kingdom Defense Minister Denis Healey made the point:

What is clear is that the Warsaw Pact had advantage in two particular respects so great as to render doubtful any prospect that NATO might have of putting up a successful conventional defense for more than a few days. These advantages are numbers of tanks and surprise. The Warsaw Pact outnumbers NATO in tanks by more than two to one in peacetime and by 2-1/2 to one after mobilization. This obviously gives them a great advantage, and no amount of figure-fixing can alter these facts.⁴⁸ (Underscoring mine)

One sees that the author has (through some method of his own, which he does not discuss) valued "the amount of force at the behest of the Soviets." This "amount," assuming the Soviets "would be the aggressor," "would produce a crushing superiority of force." This rhetoric is aimed at rebutting the expressed views of McNamara. This aim could have been accomplished from an analytical point of view had the discussion pointed up the method used to value the amount of force possessed by the Soviets and the logic used to assume the Soviets would be the attacking power.

From the same publication one finds a second example from an article entitled, "NATO's Northern Flank":

Strategic Assessment. In the south, an aggressor's aim might be to gain control of the exits from the Baltic and at the same time to secure the flank of his forces operation in western continental Europe.

⁴⁸ Ibid., Bandusiae, "The Defense of the Central Region of NATO," pp. 48-49.

With a proper command organization in this area, such as the one which is now firmly established, it is possible to exploit to the full the defensive capability of both the German and the Danish forces available. They are mutually dependent of each other, and proper coordination has been made possible through the joint Allied command.

From a military point of view, it does not seem likely that an attack against any part of this area could be carried out without involving the forces of the Central Command. The aggressor would have to regard the forces of NATO as an entity. If he attacked the forces in Denmark and/or Schleswig-holstein, he would have to reckon with these forces being supported by powerful forces of the Central Command and must plan accordingly. The defense of this area cannot, therefore, be considered in isolation, and it would not be correct to measure the isolated strength of the Northern Command forces in this area against that of a possible aggressor's without taking the whole of NATO's strength into account.⁴⁹ (Underscoring mine)

Again one sees that it is difficult to ferret out the method or reasoning whereby the author takes his particular stand.

Language such as "an aggressor's aim might be" can be translated to scientific jargon as "the assumption of this study is," although there seems to be no datum present to support this assumption. The selection of what the "aggressor's aim" might be is critical to the remaining arguments. In addition, if one substitutes "prevent control" for "gain control" in the article the consequences are logically much different than the author constructed. Lastly, the paragraph heading "strategic assessment" could do more justice to the argument if changed to "a possible assessment."

As a last example of this sort of threat assessment an article entitled, "The Soviet Strategic Offensive and the NATO Southern Flank" is cited:

⁴⁹ Ibid., Koren, C., "NATO's Northern Flank," p. 69.

There are some who doubt that NATO naval forces can survive in the eastern Mediterranean and some who go so far as to believe that survival anywhere in the Mediterranean will be impossible. There certainly are real threats which support such positions.

There is little doubt that the Soviet anti-ship missile force is intended primarily to attack and eliminate U.S. aircraft carriers. There is no doubt that this is a formidable and highly effective force when operated as an integrated system employing surface ships, land-based aircraft and submarines in coordinated reconnaissance, surveillance and attack operations. Sixth Fleet and allied naval power survival will demand that this missile system be dealt with quickly and decisively. Past experience indicates that Soviet missile-equipped naval forces will shadow NATO forces continuously and at close range under any and all circumstances. Prudence dictates that the Soviets must learn to understand that this is a particularly unhealthy occupation for their missile forces. In times of tension it is reasonable to consider that close surveillance within effective missile range by heavily armed naval forces is highly provocative and will be dealt with accordingly, even to the point of destroying offending forces if the general strategic and tactical situation has degenerated to the point where open hostility appears to be imminent. Lacking such resolve, the ability of our forces in the eastern Mediterranean to survive is questionable. These statements are not intended to argue that since survival is questionable the force should not be exposed. Rather, the intent is to argue that the western powers must maintain a favorable balance of power not only from the standpoint of quantity and quality but also from the standpoint of the will to use the naval power to maintain command of the sea in the face of any threat within the entire spectrum of naval warfare.⁵⁰ (Underscoring mine)

Again this particular author's phrasing implies that the threats he discussed are in no way implausible. Further, the reader gets no indication of how the author arrived at his conclusions.

⁵⁰ Ibid., Ashworth, F., "The Soviet Strategic Offensive and the NATO Southern Flank," pp. 79-80.

There are four principle characteristics attached to this school of threat assessment. First, the author assumes a particular aspect of threat. He uses this aspect as the perspective from which he spins out his discourse. Secondly, he carefully constructs a predictive environment with his own personal methods. Thirdly, these methods are never fully explained and usually are not referred to in the assessment process. The fourth characteristic is a resulting set of tight and neat arguments designed to convince the reader of the author's perception of future consequences. Thus, one has an exposition of the logical (at least from the author's point of view) consequences that might occur given his assumed aspect of threat as a basis.

An analyst sees many shortcomings in this sort of assessment when trying to determine how to use it in an analysis. It is difficult to attach magnitudes. It is also difficult to value the assessments because of the lack of methodological discussions. Finally, it is difficult to use this type of assessment in a sensitivity analysis because it seems to be a point estimate of threat level (although this is not clear).

B. PSYCHO-POLITICAL METHOD: THE CASE STUDY APPROACH

The psycho-political philosophy dramatizes the ingress that the social sciences have made in the defense establishment in relation to threat assessment. Although this particular school's unique methods of analyses are not mathematically rigorous, it probably has more valid

contributions in need of proper interpretation than any other discipline today. (It is problematical to ascertain when the language of communication between the social sciences and systems analysis will develop to the extent that full-fledged cooperation can exist. It seems most predictive that mathematics will likely serve as the principle mode to further this cooperation.)

On the whole, social science places emphasis on qualitative research. Therefore, social scientists naturally use this approach with respect to threat assessment. As a vehicle for discussion of this method a study entitled, "The Crisis Management Research Project" was selected to abstract:

Necessarily, this investigation emphasized the influence of military factors on the psycho-political processes of international relations in the Cold War. One may, of course be reasonably certain that strategic factors influence the thinking of decision-makers in some manner, but this kind of understanding is manifestly inadequate for the analysis and making of national policy. To analyze a government's foreign policy, answers to the following questions are needed: Exactly who is influenced, in what direction, by which military factors, and under what circumstances: What psychological processes are at work in the minds of individuals presumed to be "influenced"? Has U.S. strategic superiority contained communist expansion, forcing the Soviets to confront their own internal crises, thus bringing about a detente? Has U.S. strategic superiority tended to remove Soviet incentives to crest international incidents and tension? How does strategic superiority communicate itself or, rather, "get communicated" to opposing foreign policy-makers? What mix of strategic and tactical operations credibly communicates to a potential aggressor the resolve of the United States? The Crisis Management Research Project has sought to examine these and related

problems and to provide some solutions to them.⁵¹
(Underscoring mine)

Contrasting this method to the political-military method one senses a more rigorous approach to threat assessment.

Assumptions of the Project. The fundamental intellectual perspectives of the Crisis Management Research Project may now be summarized: The power and security of the nation-state, and the objectives it purports to achieve or enhance result in interactions with other nations. The objectives which are defended or pursued by a given nation are defined by men representing the policy or state. Those who act with authority in the name of the nation are referred to as "decision-makers". Crises are initiated, or recognized, prosecuted and resolved by such decision-makers. To manage crises successfully is to influence the decision-makers or other countries in a favorable manner.

The conduct of decision-makers, is, at least in part, a function of their perceptions about the capabilities, actions and intentions of others, their own values and perceived capabilities. These perceptions are, in part, a function of the personality and attitude set of the decision-makers.

The central purpose of this project is to evaluate the influence of strategic forces on decision-making during the management of crises. The models and methodology of this project were designed to incorporate conceptual clarity, scientific rigor and systematic analysis in order to facilitate further verification of this study and its findings by others.⁵² (Underscoring mine)

The explicit statement of the study's assumptions leave little doubt in the mind of one especially familiar with the jargon of psychology and sociology. Perhaps systems analysts in their discipline cannot tolerate the lack of operational

⁵¹ Kintner, W. R. and Schwartz, D. C., "The Crisis Management Research Project," A Study on Crisis Management, Foreign Policy Research Institute, University of Pennsylvania for the Director of Plans, as an augmentation of Contract No. AF 496382349 (University of Pennsylvania, May 18, 1966), pp. 11-2 to 11-3.

⁵² Ibid., p. 11-10.

definitions and the substitution of verbal vice mathematical explanations. For example, the purpose of the project was "to evaluate the influence of strategic forces" might translate for a systems analyst as "to measure the range of the threat of strategic forces." After substituting for "influence," "the range of threat" an analyst would then go on to operationally define what threat of strategic forces entailed.

The declaration of assumptions and the use of concepts assuming a primitive meaning is the approach of this method. This approach however, is several magnitudes more rigorous than the political-military approach.

The qualitative nature of this philosophy is a product of the training of the scientists using it.

It may be well, at this point, to stress the essentially qualitative aspect of this research. Our indexes should not be taken for sophisticated scales. Yet, they do convey some basic changes in perceptual variables and provide the basis for determining any patterns the variables assume in crisis decision-making.

Each of the following perceptual factors were treated in the same way. An index of factors or information on which the perception was assumed to be based was developed. The project staff rated the degree to which the index would support a government's perception of the variable in question.

7. Level of threat-"Threat" is more direct and specific than "tension" and more observable than "stress." Our index for threat was based on the semantics of crisis communication (e.g., "serious," "grave," or "awesome") and situational fears (immediate nuclear attack on homeland, loss of bloc partner, loss of strategic base, or loss of prestige).

8. Perceived opposing hostility . . .

9. Perceived likely allied response to crisis policy . . .

10. Perceived likely neutral response to crisis policy . . .

11. Perceived likely reaction of citizens to crisis policy . . .

12. Number of alternatives . . .
13. Receptivity to communication . . .
14. Centralization of decision-making . . .
15. Degree of change in established doctrine . . .
16. Intelligence . . .
17. Number of powers involved . . .
18. Directness of confrontation . . .

The basic method of research was to assess values of each independent and dependent variable in each of the three selected phases (initiation, peak, and resolution) in each of the crises under study. All variables were weighted on a 0-10 scale. The nature and direction of changes in each variable through time were then apparent. Observable regular changes in each of the fifteen dependent variables were correlated with each other and with changes in the three independent variables. Similarities of directional change between the independent and the dependent variables were interpreted as variations in the perception of strategic factors during crisis decision-making.⁵³ (Underscoring mine)

The terminology of these types of studies is of specific meaning to scientists versed in psychology and sociology. The "0-10 scale" in this particular article is in the realm of the systems analyst and its mention reveals the first major drawback of this sort of study, the lack of mathematical rigor. The measurement of the variables, all on a "0-10 scale" make implicit assumptions. To begin, a 0-10 scale is assumed arbitrary and therefore, ordinal. Also, it is not clear that the "12. number of alternatives" and "13. receptivity to communication" variables can be measured on the same scale, or necessarily an ordinal scale. That is, is a 5 for "12. number of alternatives" equal or of the same significance as a 5 for "13. receptivity to communication"? One would think not. This type of naive mathematical reasoning

⁵³ Ibid., pp. 11-16 to 11-17.

is generally characteristic of this method. (The last paragraph of the quote talks about correlation of dependent and independent variables with themselves and each other. Whether this is correlation in a rigorous (mathematical) sense is not clear. If statistical correlation was used then the significance of parametric statistical methods applied to ordinal data is questioned.)

The model used in this school reflects this mathematical naivety and is usually a way of thinking about the problem as opposed to a rigorous model. It may be that the concepts involved in threat quantification are so little understood that mathematical model development is impossible at this time. This remains for future investigative effort.

The model which suggests the selection and integration of these variables is an attempt to synthesize the major theoretical approaches in international studies. From traditional assumptions in international politics, for example, the notions of threat capability and use of weaponry, have been taken. Thus, we can test the basic hypothesis that foreign policy makers act in order to maximize utilities. We are aware, however, that what is to be maximized is a function of basic values and goals.

The traditional or institutional approach to international politics suggests the concepts of centralization, doctrine, and intelligence. These concepts are meaningful perceptual terms. The responses of allies, neutrals, citizens, etc., will affect the adoption of policies which derive from centralization, doctrine and intelligence.

From these general considerations, a set of concrete interrelated hypotheses were derived and tested . . . Some of the major hypotheses of the Crisis Management Research Project are suggested relationships between the perceptual variables in the model of crisis decision-making discussed earlier in this chapter. Here, we state these hypotheses, show how they derive from theory and observation, and then examine the limits of their validity. In brief, some of the basic general relationships between

strategic aerospace factors and crisis decision-making are set forth.⁵⁴ (Underscoring mine)

Here is the point where the political-military and the psychopolitical philosophies start to parallel one another. At least, from this point on the psycho-political school uses the same method as the political-military method. That is, after the social scientist produces statements concerning the assumptions, purposes, definitions, and hypotheses, he then logically carries the reader to several conclusions through the use of his discourse.

The specific allegations of the political-military analyst do not appear in this method. In this method's conclusions one sees the more conservative scientific demeanor of the psycho-political practitioners.

General Conclusions. We do not assume that strategic superiority can solve all crises or that escalation theory can completely explain them. Strategic superiority needs to be communicated to be effective. Escalation calls for interpretation. In brief, the threat of future strategic actions must be credible.

The purpose of this study is to facilitate assessment of the credibility and communications requirements of crisis management.⁵⁵

The general nature of this school of threat assessment is characterized by the case study. After setting down their purposes and assumptions in detail, trained scientific observers collect data. Then hypotheses (after observation) are constructed and "tested" in relation to what was observed (in the language of the example, "here we state these

⁵⁴ Ibid., pp. 11-17 to 11-18.

⁵⁵ Ibid., pp. 11-22.

hypotheses, show they derive from theory and observation, and then examine the limits of their validity").

The disadvantages of this method in relation to systems analysis are its nonmathematically rigorous nature and use of vocabulary that is specific to a highly developed discipline.

The deficiencies of the method from an analytical point of view are parallel to the political-military method. The measurement of the assessment process takes place in the minds of men and it is extremely difficult to place magnitudes on the evaluations in these studies. (Since this method presents several alternative states of the world in its conclusions, if one could enumerate the studies' assessments, sensitivity analyses could be accomplished. This would be difficult using the political-military approach.)

The manner in which social scientists derive their hypotheses must be questioned. Who is to say that the implantation of these hypotheses is not the ulterior motive of an enemy power? That is, if one derives his hypotheses for "testing" as the study states from "theory and observation," then the observations are necessarily the moves and counter-moves of the enemy. To restate the question, how can one be sure that these hypotheses are not elaborate plans constructed by those one observes? How does one determine the interactions between observer and observed? This cause and effect relationship directly affects the value of this type of study.

It seems that until one can determine the interactions involved one cannot value this method in a proper manner.

C. BEHAVIORAL MEASURES-CONTENT ANALYSIS

This philosophy of threat assessment is in part a product of the social sciences, the behavioral sciences in particular. There is one difference: the behavioral scientists who partake of this type of analysis use statistical procedures to reach their conclusions, unlike the psycho-political approach. These statistical procedures are called statistical pattern recognition procedures in systems analysis. (For an especially vivid explanation of this method of analysis see Inference and Disputed Authorship: The Federalist, [Ref. 15]).

Statistical pattern recognition is a method of deducing patterns or signals in a data stream over time through the use of statistical decision theory and probabilistic reasoning. In the case of the behavioral measures method of threat estimation certain words or phrases or groups of words are selected by the behavioral scientist as representative of a particular concept. Sample data-streams are studied to empirically determine the distribution of this concept throughout written or spoken matter (if this is not feasible a distribution is assumed). Once this distribution is determined or assumed, statistical regions of acceptance or rejection are determined based on Types I and II errors selected by the experimenter through his use of decision theory and its logic [See Ref. 6]. With these tools at hand

the behavioral scientist can insert entire texts of messages, writings, articles or speeches from the country in which he is interested into a statistical computer program. This program is designed to test statistically for the presence of the concept. The scientist's selection of the words or phrasing as representative of a concept is much like setting up a scale. The more subdivisions of the concept, the finer one is able to "measure" the level of the presence of conceptual patterns.

Briefly, this method is termed content analysis in the behavioral sciences. There are several methods of application of this analysis not necessarily involving the use of a computer. The term thematic content analysis (thematic defined as: of or relating to the stem of a word or constituting a theme) is usually applied to written material. Content analysis is applied to visual material. The history of content analysis is a long one but the application of statistical pattern recognition procedures in conjunction with content analysis is novel.⁵⁶

Loubert and Stacey [Ref. 27] in their review of five of the original papers using statistical content analysis comment on the complexity of the problem of assessment and

⁵⁶ Loubert, J. D. and Stacey, C. H., Project Michelson Studies of Communist China: An Examination of the Relevance of Selected Findings, A technical report prepared under contract for Group Psychology Branch Psychological Sciences Division, Office of Naval Research, HSR-TN-6613-CS (Human Sciences Research, Inc., July, 1966), p. 1.

bring up a fundamental question concerning the method of statistical content analysis:

After careful examination of the various studies, it became apparent to HSR [Human Sciences Research, Inc.], analysts that the authors were wrestling with a particularly difficult problem in the behavioral analysis of political affairs. In dealing with specific events (crises) where a minimum of reliable information is available, how can we move from even the simplest level of abstraction to an evaluation of the "reality world" of one of the principal actors? In the North series, the authors apparently were using the following adaptation of the classical S-O-R paradigm: The crises are the Stimuli, the Peking leadership is the mediating Organism which evaluates the crises through its perceptual filters, and the Responses are the official statements which purportedly describe these perceptions and announce Peking's reactions. In the McClelland studies the Responses included both Peking's statements and physical acts (Attack, Withdraw, etc.). As such, the McClelland studies appear to provide greater assurance of reliability since discrepancies between threats and actions can shed light on bluffing tactics. In both studies, additionally, the authors studied the actual crises to determine if the facts supported or disconfirmed their quantitative findings.

The fundamental question still remains, however: "With necessarily fragmentary information of the circumstances involved, can the authors of these studies move from the measurement of Chinese hostility to an explanation of its causes?"⁵⁷

(Underscoring and comments in brackets mine)

The shortcomings of this method are clearly pointed out by Loubert and Stacey: Can the causes of hostility or threat be ferreted out of written or visual material? Can behavioral scientists isolate the unintended messages contained in official communications and the implicit patterns underlying official interactions between nations?

⁵⁷ Ibid., p. 4.

Loubert and Stacey warn their readers:

Despite the many problems which beset the novel approach to the analysis of international relations, the studies of North, et al. and McClelland, et al. contain preliminary indications that behavioral scientists can take ordinary published materials from open sources, subject them to sophisticated statistical analysis, and come up with potentially valuable insights for decision-makers and their support staffs. They can do this because they are looking for and finding the unintended messages contained in official communications and the implicit patterns of international actions. Although the present state of the art is not such as to produce results which can be used with confidence, such insights into the behavioral patterns of foreign leaders can become valuable to our decision-makers, to the extent that their validity and reliability is demonstrated. In any case, the authors of these studies should be commended for demonstrating courage in addressing themselves to the most complex aspect (crises) of international relations.⁵⁸

The shortcoming of this method, in the eyes of systems analysts, is that of communications. The scales that behavioral scientists construct do not reflect the purposes of systems analysts. The relative or absolute magnitudes of the concepts involved are not determinable without communicable scaling procedures between disciplines. Again as in the psychological approach, the highly developed jargon of behavioral scientists does not convey the same meaning to systems analysts.

D. SUBJECTIVE MEASURES-EXPERT OPINION QUANTIFIED

If one accepts the premise that learned men in a particular field (or so-called experts) can be harbingers of future events of their particular discipline, one agrees with

⁵⁸ Ibid., p. 2.

this method which also accepts this hypothesis.

In this context, subjective measures means the use of mens' minds as measuring devices in a methodical and reproducible manner. Therefore, implicit to this philosophy is the assumption that the answers or proper measures can be solicited from mankind. Of course, this is not an original premise, it is as old as man and his decision-making. Men make their decisions by mental processes that one would think are biased by their total experiences and their present and self-predicted environments.

The most sophisticated decision-makers who use complex analyses and answers also implicitly believe in this method. Given several alternatives a decision-maker must make a decision. The valuation of the best decision by the decision-maker is an individual subjective measurement. In other words, the decision-maker values alternatives mentally by his own unique mental processes. He then selects as his alternative the one with highest value.

There exists several methods for dealing with these valuations (which will be called opinions here). Campbell [Ref. 35], Brown and Helmer [Ref. 29], Dalkey [Ref. 34], Gordon and Helmer [Ref. 32], and Maier [Ref. 24], discussed methods of dealing with opinions. The method developed by the scientists at the RAND Corporation called the Delphi technique and espoused by N. C. Dalkey is used here for purposes of discourse.

The salient features of the Delphi technique are that it dampens interactions caused by face-to-face confrontation of men in discussions. It allows individuals not to be subjected to dominant individuals or group pressures. It also allows the noise factor that group discussion creates to be discarded.

Dalkey describes his method in a paper entitled appropriately, "Looking into the Future":

The basic characteristics of the Delphi procedures are: (a) Anonymity, (b) Interaction with controlled feedback, (c) Statistical group response. Anonymity is achieved by using questionnaires or other formal channels of communication, where specific responses are not associated with individual members of the group. This is a way of cutting down on the effects of dominant individuals and reducing group pressure. Interaction consists in performing the interaction among members of the group in several stages; typically, at the beginning of each stage the results of the previous stage are summarized and fed back to the members of the group, and they are then asked to reassess their answers in light of what the entire group thought on the previous round. Controlled feedback allows interaction with a large reduction in noise. Finally, rather than asking the group to arrive at a common opinion, a consensus, the group opinion is taken to be a statistical average of the final opinions of individual members of the group. In the experiments we have conducted, the median opinion—that is the middle estimate where half the group is on one side, and half on the other—has turned out to be the most accurate. By using a statistical group opinion, group pressure toward conformity is further reduced, and probably more important, the opinion of every member is reflected in the group response.⁵⁹

As previously mentioned the subjective measure has been the manner by which man has solved his problems throughout his existence. Prior to the so-called scientific method

⁵⁹ Dalkey, N. C., Predicting the Future (RAND Corporation Report P-3948, October 1969), pp. 8-9.

men relied on their judgments, whether individual or collective. The construction of the scientific method of laboriously presenting evidence supporting one's conclusions has judgments as the glue which holds it together, that is, men and scientists make qualitative judgments. Judgments color all human activity, even science.

The Delphi technique and the subjective measures philosophy it represents is a method that carefully uses the opinions of men in a manner that can be controlled and reproduced in part. Whether the answers to threat prediction and assessment can be acquired using this method remains to be seen but as Dalkey points out, there is reason for optimism.

Let me sum up: Opinion plays a basic role in long range forecasting of technological and social development. The traditional ways of dealing with opinion have significant drawbacks. Our experiments have shown that it is possible to design techniques for putting the opinions of a group of individuals together that avoid some of these drawbacks. However, the improvement is small.

The next step is to see whether we can dampen the effects of group pressure, in this case excessive convergence, and amplify the movement toward the true answer. We have to wait on further experiments to see whether these are possible, but we have some grounds for optimism.⁶⁰

Although this method has not been directly applied to the assessment of threat present or future, it seems a promising one because the type of answers can be tailored by the types of questions used in connection with the method. Answers useful to the systems analyst can be solicited by this method.

⁶⁰ Ibid., p. 19.

The shortcomings that are anticipated in connection with the use of subjective measures are major ones. How does one go about selecting the experts to question with the subjective measures technique? And if this problem is solved, does the answer lie in the minds of these experts? Presently, these questions are devoid of practical significance because as yet no way exists to verify the method in its present crude stage of development. Once a theory of subjective measures is developed, it seems likely that this method can play a major role in the assessment of threat. (As a sidelight the reader is reminded of the problem that was discussed in Section V, page 53, that concerned the difficulty systems analysts have presently in interfacing with the decision-makers they serve. Subjective measures methods could presently have direct application to this problem.)

E. SYSTEMS ANALYTIC METHODS

It is not the purpose of this section as in the preceding four, to outline the methods used by systems analysts to assess threat for use in studies by the defense establishment. The task is far too complex to attempt here. The factors that complicate such a task are many. First, many diverse methods are used and no single method can be used to represent all of the others. Secondly, this paper has implicitly rejected present methodologies used in connection with the quantification of threat. Third, since access to the decision-makers in high-level defense positions can be obtained only by dint of the authority of these same

decision-makers this access was regarded as impossible for the purpose of this paper. Without this access the trace of how threat assessment actually takes place today in the Defense Department must remain indecipherable.

The purpose of this section is to point up the problem, that of tracing how threat assessment takes place in the Defense Department, and comment on why it is of concern (this paper also is submitted to lie in evidence of this same problem).

Prior to the introduction of the planning, programming and budgeting system in the Defense Department, the budget level for defense was set by the Chief Executive. Secretary McNamara's attempt to make the defense budget a numerical reflection of political purposes has prompted this study. Since the early sixties defense decision-makers have striven to provide for the common defense in a manner reflecting the threats to this nation. The method that these decision-makers use to recognize these threats is not clear however. The National Security Council and its members generate policy for the guidance of the defense establishment. For security reasons the construction of these policies and many times the policies themselves are not published. It is questionable whether any documentation exists setting forth the method whereby the National Security Council (with inputs from the Defense Department, Central Intelligence Agency, State Department and various other government and private agencies) assesses threats to this country. It is doubtful that if

such documentation existed, it would contain the highly personal decision processes unique to the members of this council (The National Security Council is composed of the President, the Vice-President, the Secretary of State, the Secretary of Defense and the Director of the Office of Emergency Preparations).

It is important that efforts be made to fill in the gaps in knowledge concerning how individual defense policy decisions relate to the spectrum of threats faced by this country, because of the paramount importance of the need to discover the spectrum of threats to this country.

VII. CONCLUSIONS, RECOMMENDATIONS AND PROPOSALS FOR FURTHER RESEARCH

A. CONCLUSIONS

This developmental paper's method has been to use discourse and example to attempt to heuristically define little-understood problems. At this time it can be concluded that these problems are not only little-understood and extremely complex, but that this present paper is woefully incomplete.

This paper has used propaedeutic discussions touching on many disciplines outside the confines of systems analysis because of the nature of the problem researched. To conclude at this time that systems analytic techniques or its practitioners will be able to construct a method to properly assess threats to this country is folly. It can be concluded that the efforts of many disciplines will most surely be needed.

Further efforts to investigate threat assessment as practiced today in the defense establishment coupled with comprehensive efforts to document and evaluate these types of assessments are needed to form a data-base. From this data-base efforts to construct a realistic, pragmatic, and effective methodology that would be capable of outlining threats to this country could be conducted. To date, documentation of threat assessment methods is scarce. Few papers deal with this problem as an entity. One must interpret methods from many and varied sources that use techniques of

threat assessment as a method to solve what is considered a subproblem, inferior to the document's main themes. The conclusion here is that until scholars consider this problem by itself and generate research in relation to threat assessment, efforts, such as this one are doomed to inadequacy because of the bare spots that are left in the analysis that could not be spared any allocation of effort. These bare spots cannot be filled in by others' efforts because none exist.

This paper has not dealt with the enormous number of practical problems that plague defense planners in relation to threat assessment. It has never defined threat or assessment. It has not exhaustively listed present government sources that might contribute to a theory of threat assessment; nor has it listed the possible disciplines that should be enlisted in an effort to solve this problem. What this paper has attempted to do by side-stepping these very real and important problems is to make them meaningful by exploration of the structure of threat assessment. Once one can perceive the structure of the threat assessment process, it is anticipated that one can conclude that enormous difficulties lie in the path of the investigator.

The understanding of nature by mankind is of epic proportions at this writing. Man's understanding of the phenomenon of man and the phenomena of man in relation to his works is in a crude state of development. In fact, the ages of the development of mankind are named after many of the

constructs of man because of the vast changes in man's life that these man-made items have generated. We have lived in the Nuclear Age for a generation but the effects of nuclear fission cannot be foretold by mankind. Heisenberg attempted to state his position in relation to how man might finally understand physical nature in 1932.

I have attempted to show how physics and chemistry-driven, we hardly know by what force-have continuously developed in the direction of a mathematical analysis of nature under the guiding principle of unification. The claims of our science to an understanding of nature, in the original sense of the word, have at the same time decreased. The attempt to prove impossible a perception-theoretical understanding of the latter kind, and to prove mathematical analysis the only possible way, appears to me as unwise as the opposite assertion, that an understanding of nature can be achieved in a philosophical way without a knowledge of its formal laws.⁶¹

Given that man's understanding is in a crude stage of development in relation to understanding the phenomena of mankind related to his works, this paper concludes that no method of assessing threat can necessarily be developed without further progress by science attempting to understand the phenomena of man and his works.

B. RECOMMENDATIONS

1. Reallocation of Research Efforts Within Systems Studies

Since the estimation of threat seems to be the basis for most systems analysts, further effort should be allocated to discover proper methods of threat assessment. The

⁶¹ Heisenberg, W., Philosophic Problems of Nuclear Science (Pantheon Books, Inc., 1952), pp. 39-40.

crude and over-hasty estimation of threat not only oversimplified a complex concept but invalidates conclusions based on such estimates.

2. Abstract Fundamentals

Investigation into the abstract fundamentals of the phenomena of threat are needed if rigorous development of models similar to those presently used in systems analysis can ever be accomplished. A most meaningful addition to the tools presently available to systems analysts would be a calculus of threat assessment coupled with operational theorems developed from axioms of the calculus.

3. Threat Assessment Relevant to Present Policy Planning

The discovery and documentation of the actual working method presently used by the defense establishment including the National Security Council is a paramount goal. This documentation can find use as a starting point to value methods or philosophies that already exist in relation to threat assessment. This documentation could be accomplished with minimal use of resources and manpower. It is recommended that prior to further research into different methodologies the present one be discovered.

C. PROPOSALS FOR FURTHER RESEARCH

1. Increasing the Effectiveness of Judgment and Intuition

Since the defense establishment involves itself increasingly with problems, with no known scientific methods to handle them, it seems that the enhancement of judgments, intuition and opinion of defense decision-makers must be

attempted through the use of methods such as Delphi. (See Section VI, Part D). It is proposed that research into a practical plan for application of this method or a method especially tailored for the Department of Defense be constructed. This research could be as basic as the formulation of a plan of which particular decision-makers should be called on for judgments concerning what general class of problem. A more complex approach would develop a plan for a section or department whose sole concern would be qualitative judgment sampling on a permanent scale within the government establishment on a par with the various departments. This department's job might be to develop threat indexes similar to the Dow-Jones Averages. Indexes could be investigated and research conducted on how to construct indexes for use by the military, the intelligence agencies, the State Department and the Defense Department. It is anticipated that an index constructed for the State Department would not be compatible with one made for use by systems analysts in the Defense Department.

2. Data-Base Investigation

To further efforts between disciplines that seem to be of future help in the problem of threat assessments, it is proposed that the knowledge of human and group behavior found in psychology, sociology and related behavioral sciences be developed in a form that could be rigorously applied. That is, develop operational definitions of concepts enjoyed in these disciplines, document the general

results of pertinent studies already carried out by these disciplines in such a form as to be of use by defense analysts. This type of research could be of a survey form conducted by a systems analyst in conjunction with a behavioral scientist. Lazarsfeld points up this problem:

In addition to training and creative work there is a third road. We need investigations which clarify in a more general way the possible relations between mathematics and the social sciences. We should take specific problems and look at them with the end in mind of understanding better how the structure of behavioral science thinking and the structure of various mathematical methods fit each other. It is along this line that the present volume intends to make its main contribution.⁶²

3. The Conduct of Research to Relate National Goals to the Threats to These Goals

This research would probably be a listing, as exhaustive as possible, of National Goals. These National Goals then could be related to threats to them. The purpose of this type of research would be to help canalize Defense Department thinking along these lines so that their interpretation of the common defense in relation to the desires of the American people would be adequate.

4. Derivation of a Horizon for Predictive Problem Purposes

This research would endeavor to develop a planning horizon to use in various predictive problems which concern defense analysts. For example, is it feasible to expand resources to cost-out large programs? If so, how far into the future is it practical to attempt accurate costing?

⁶² Lazarsfeld, P. F. (ed), Mathematical Thinking in the Social Sciences (The Free Press, 1954), p. 5.

Is there a cost horizon that beyond this time little can be gained in attempting to estimate project costs?

This sort of research can concern itself with cost horizons, contingency plan horizons (for example, is the five year time frame a feasible one for the five year joint strategic plan?), and program effectiveness horizons.

5. Meta-Logic for Threat Assessment

As the final proposal for research it is recommended that investigation be conducted into why certain method(s) is (are) necessarily the correct one(s) to apply to the assessment of threat.

For example, simulation techniques on high speed computers were developed to get answers to problems that would have been astronomically expensive if trials had been attempted from which to extract data. The validity of simulation methods are in question today while their verification is relatively simple. The reason is that a meta-logic to construct the logic of simulation has not been formulated. Therefore, validating a simulation with respect to the phenomena it represents is formidable.

Similarly, the assessment of threat has heretofore taken place or been simulated largely in the minds of men. If a method possessing scientific rigor can be developed, it must be validated that it actually represents the real world. This job would be several magnitudes simpler if a logic or calculus of threat assessment could be constructed. The construction of this logic must be preceded by a meta-logic to construct the logic itself. [See Ref. 19]

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